

*Memorandum*

**CONTROL DATA**  
**161 TYPEWRITER**  
UNIT

# **CONTROL DATA 161 TYPEWRITER**

UNIT

This revision contains ECO 9, permitting encoded backspace, upper case, and lower case keyboard operations to be sent to the computer. Use this revision instead of publication 073d for 161 serial numbers 129 and above, and for earlier serial numbers having ECO 9 installed as an optional field modification.



## CONTENTS

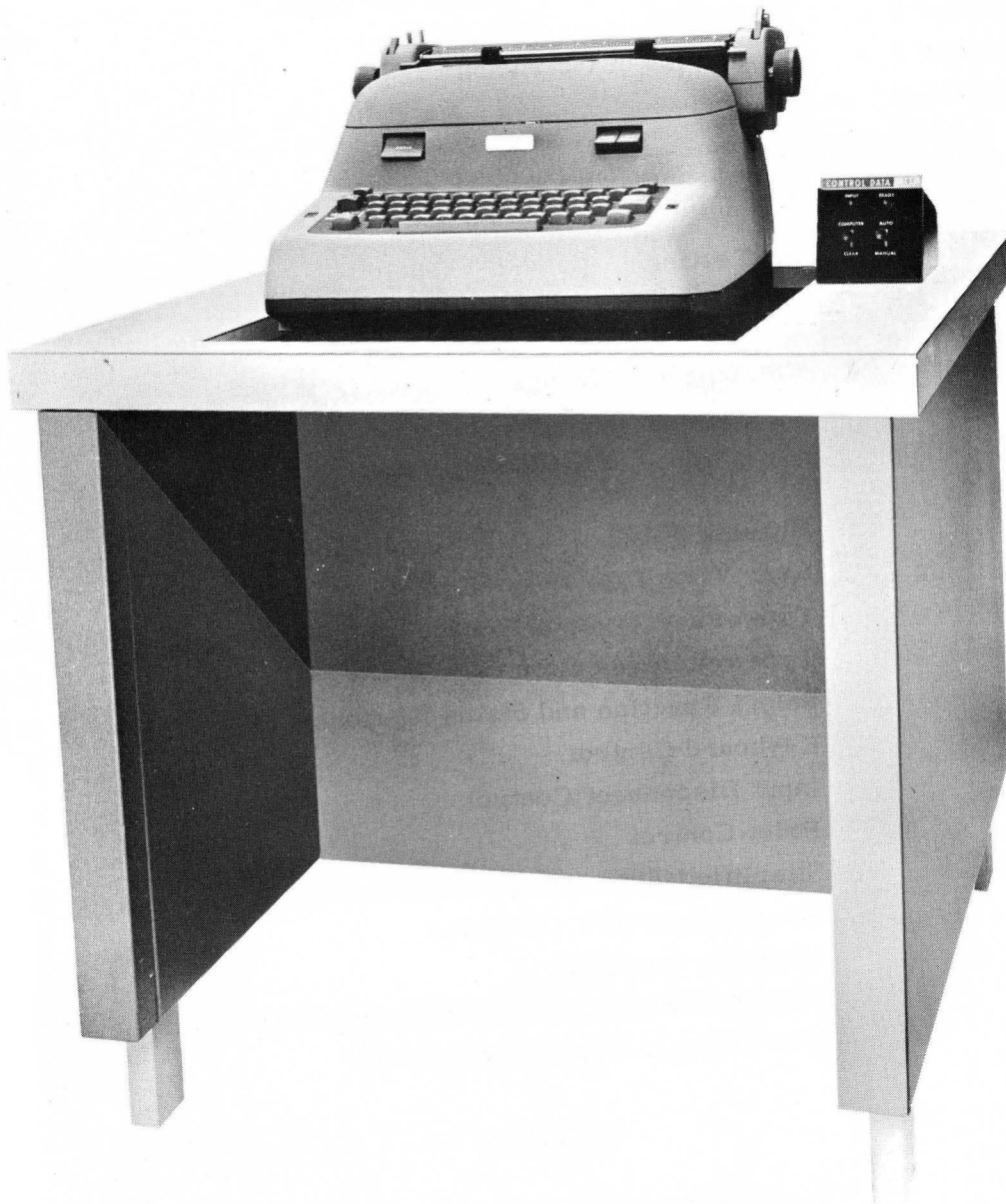
|           |                                                |     |
|-----------|------------------------------------------------|-----|
| Chapter 1 | Description                                    | 1-1 |
|           | Typewriter Unit Characteristics                | 1-1 |
|           | Computer Instructions and Typewriter Operation | 1-5 |
| Chapter 2 | Operation                                      | 2-1 |
| Chapter 3 | Principles of Operation                        | 3-1 |
| Chapter 4 | Maintenance                                    | 4-1 |
|           | Test Equipment and Tools                       | 4-1 |
|           | Identification Numbering System                | 4-1 |
|           | Power and Cooling                              | 4-2 |
|           | Cabling                                        | 4-5 |
|           | Typewriter Unit Testing                        | 4-5 |
|           | Preventive Maintenance                         | 4-7 |
| Chapter 5 | File of Equations                              | 5-1 |
| Chapter 6 | Equipment Drawings                             | 6-1 |

## FIGURES

|     |                                             |     |
|-----|---------------------------------------------|-----|
| 1-1 | Chassis 30100                               | 1-2 |
| 1-2 | Rear View Typewriter Unit                   | 1-3 |
| 2-1 | Typewriter Control Panel                    | 2-1 |
| 3-1 | Typewriter Selection                        | 3-2 |
| 3-2 | Select Function and Status Response         | 3-2 |
| 3-3 | Keyboard Control                            | 3-3 |
| 3-4 | Input Disconnect Control                    | 3-5 |
| 3-5 | Print Control                               | 3-6 |
| 3-6 | Simplified Typewriter Print Timing          | 3-7 |
| 4-1 | Steady-State OFF Condition                  | 4-4 |
| 4-2 | Magnetic Amplifier                          | 4-4 |
| 4-3 | Voltage Detection and Stabilization Network | 4-6 |
| 4-4 | Over-Voltage Protection Circuit             | 4-6 |

## TABLES

|   |                         |     |
|---|-------------------------|-----|
| 1 | Typewriter Codes        | 1-4 |
| 2 | Indicators and Switches | 2-2 |
| 3 | Replaceable Fuses       | 4-2 |



## CHAPTER 1

### DESCRIPTION

The Control Data 161 Typewriter Unit is an optional input-output device for the 160/160-A Computer System. The typewriter unit consists of an IBM electric typewriter modified by Soroban Engineering, Inc. and a control chassis. The typewriter, which operates at a rate of approximately 10 to 12 output characters per second, may be used as a keyboard input device or as an output device for producing printed copy.

The unit is 30 inches long, 30 1/2 inches wide, 37 1/2 inches high and weighs 350 pounds. A fan at the bottom of the cabinet air-cools the components by circulating air-conditioned room air. Cooling requirements are approximately 2300 BTU/Hr. Power requirements are 115v, 60 cps, 14 amp.

The unit has a self-contained d-c power supply. The control circuits are contained in a single logic chassis (30100) (figures 1-1 and 1-2). The chassis is hinged for easy access to the wiring side.

Control panel switches and indicators allow the operator to monitor and manually control the operations.

Information passes between the typewriter unit and the computer via two cables which connect at the bottom wiring side of the logic chassis. Wires jumper these two cable connectors to allow other equipment to communicate with the computer on the same communication paths. If more than one typewriter is included in the system, internal biasing changes are required.

### TYPEWRITER UNIT CHARACTERISTICS

The typewriter unit provides the computer with a flexible monitoring input-output device. Through this medium, data may be entered manually into the computer, or, in the output mode, monitoring information in a printed form may be received from the computer. Typewriter character and function codes are listed in table 1.

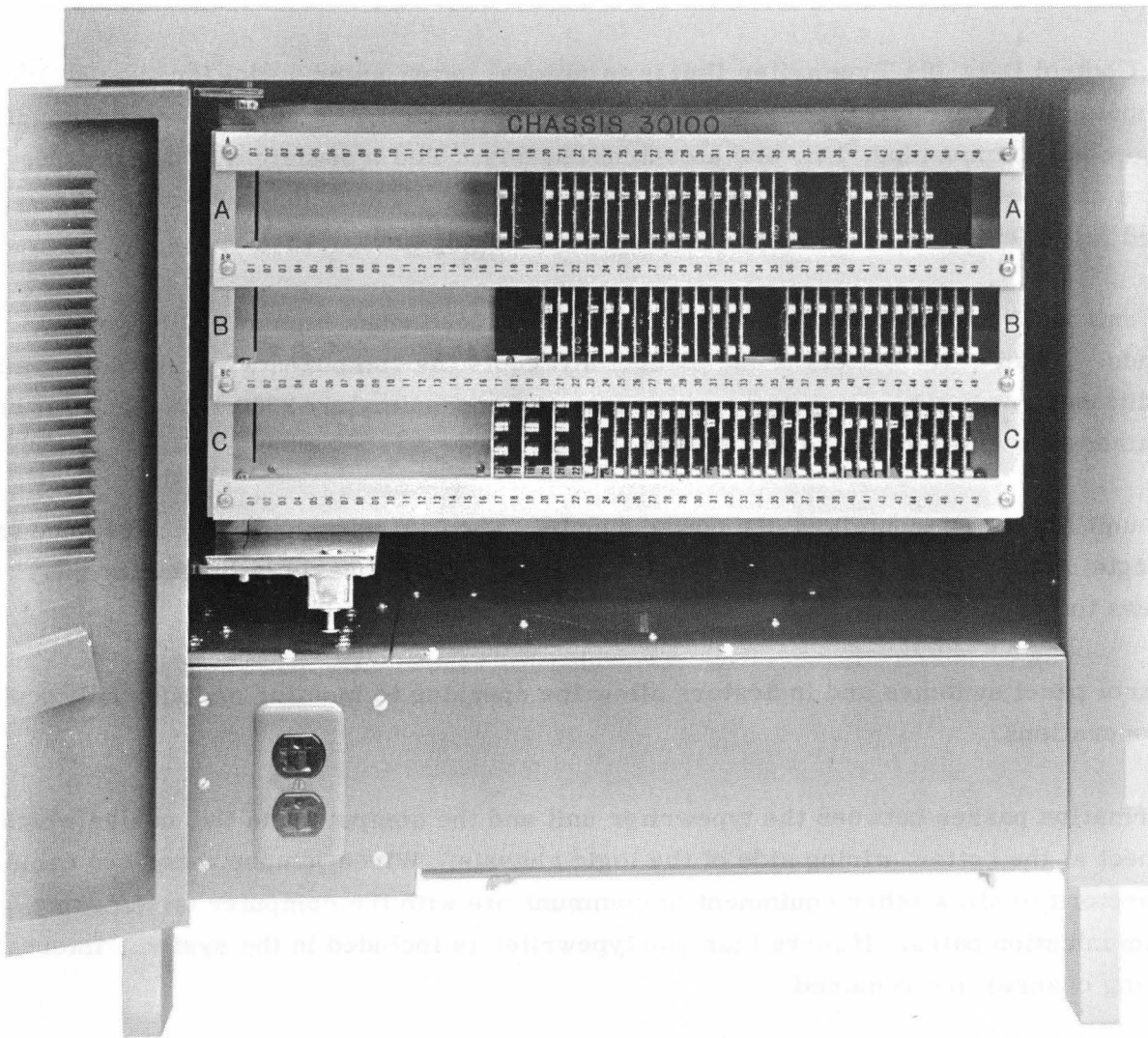


Figure 1-1. Chassis 30100

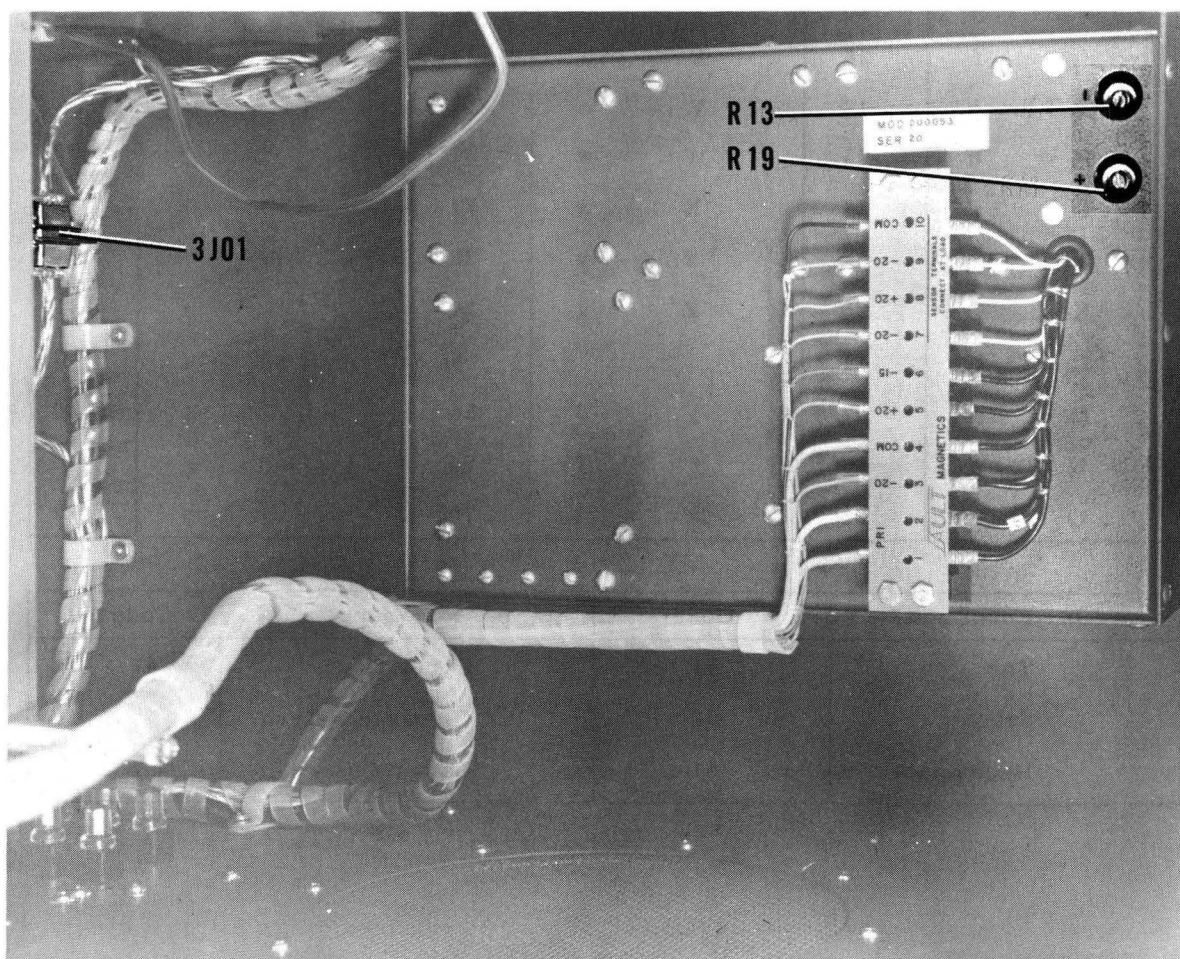
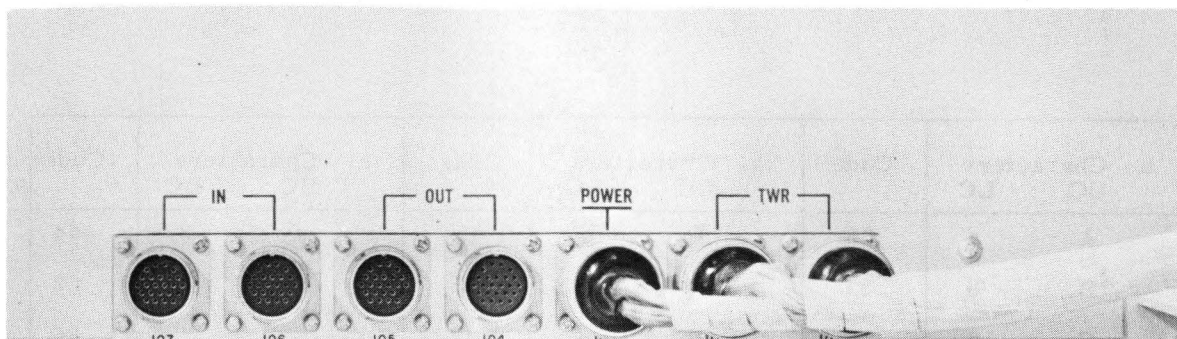


Figure 1-2. Rear View Typewriter Unit

TABLE 1. TYPEWRITER CODES

| a. Characters<br>UC      LC | Code | a. Characters<br>UC      LC | Code | a.. Characters<br>UC      LC | Code |
|-----------------------------|------|-----------------------------|------|------------------------------|------|
| A      a                    | 30   | P      p                    | 15   | #      3                     | 64   |
| B      b                    | 23   | Q      q                    | 35   | \$      4                    | 62   |
| C      c                    | 16   | R      r                    | 12   | %      5                     | 66   |
| D      d                    | 22   | S      s                    | 24   | £      6                     | 72   |
| E      e                    | 20   | T      t                    | 01   | &      7                     | 60   |
| F      f                    | 26   | U      u                    | 34   | $\frac{1}{2}$ 8              | 33   |
| G      g                    | 13   | V      v                    | 17   | (      9                     | 37   |
| H      h                    | 05   | W      w                    | 31   | —      -                     | 52   |
| I      i                    | 14   | X      x                    | 27   | ?      /                     | 44   |
| J      j                    | 32   | Y      y                    | 25   | "      '                     | 54   |
| K      k                    | 36   | Z      z                    | 21   | °      +                     | 46   |
| L      l                    | 11   |                             |      | .      .                     | 42   |
| M      m                    | 07   | )      0                    | 56   | :      ;                     | 50   |
| N      n                    | 06   | *      1                    | 74   | ,      ,                     | 40   |
| O      o                    | 03   | @      2                    | 70   | ÷      =                     | 02   |

| b. Functions | Code | b. Functions    | Code |
|--------------|------|-----------------|------|
| Tab          | 51   | Upper Case      | 47   |
| Space        | 04   | Carriage Return | 45   |
| Back Space   | 61   | Lower Case      | 57   |

# COMPUTER INSTRUCTIONS and TYPEWRITER OPERATIONS

The computer communicates with the typewriter unit on one input and one output cable. Each cable is a self-contained unit with its own control lines. The control and data lines are activated by the following instructions:

|                   |          |            |          |
|-------------------|----------|------------|----------|
| External Function | (EF 75)  | Input      | (INP 72) |
| Output            | (OUT 73) | Input to A | (INA 76) |
| Output Direct     | (OTN 74) |            |          |

## COMPUTER INSTRUCTIONS

EF (75) The typewriter unit is selected and placed in the input or output mode. An EF instruction sends a 12-bit code on the output cable to all equipment connected to the computer. The upper 6 bits of the code specify the equipment, the lower 6 bits specify the operation requested. An accompanying function ready signal enables the external equipment to interpret the information as an EF code according to the following list.

Typewriter Unit Select Codes:  
4210 Select Typewriter Output  
4220 Select Keyboard Input  
4240 Request Typewriter Status  
43XX Alternate Unit Selection

The control circuit interprets and stores the EF code and initiates the operation requested. It also sends an output resume signal to the computer to acknowledge acceptance of the EF code. For all operations, after the output resume is returned to the computer, the control circuits establish a lockout so that further computer EF requests will be ignored until the current operation is complete.

OUT (73) Output words are transferred from the computer over the output cable to an external device selected previously by an EF instruction. For the typewriter unit, the lower 6 bits contain the information to be typed out; the higher 6 bits are ignored. An information ready signal accompanies each computer output

word (one typewriter character or function code) and the logic circuits return an output resume when the word is accepted.

- OTN  
(74) One word of output data is transferred over the output cable to the external device selected previously by an EF instruction. A data word consists of zeros in the upper 6 bits and the E portion of the OTN instruction in the lower 6 bits. The typewriter recognizes this as a single character which it types out. An information ready accompanies the word and the logic circuits of the 161 return an output resume to the computer when the word is accepted.
- INP  
(72) Data words (lower 6 bits) are transferred over the input cable to the computer from an external device selected previously by an EF instruction. An input ready signal is sent to the computer. The computer issues an input request signal to the typewriter unit prior to receipt of the first word and after storage of each word except the last.
- INA  
(76) The response of an external device to a previous EF status request instruction is placed in the computer A register. The response is a 12-bit quantity which is interpreted by the computer. The computer instruction causes one input request signal to be issued. The equipment responding sends an input ready to the computer with the response.

## TYPEWRITER OPERATIONS

### Input

An input operation is initiated by a 4220 EF code followed by an INP instruction. The control circuits store the keyboard select command and the function ready signal; an output resume signal is sent to the computer. The computer executes the INP instruction, issues the input request signal, and turns on the INPUT signal light on the control panel of the typewriter unit. As each character is typed, its code appears on the data lines to the computer and an input ready signal is produced. The computer accepts the character and returns an input request if it requires more information.

The computer returns to the program when an input disconnect signal is issued by the first carriage return following absence of the input request signal. The operator may also generate an input disconnect signal by placing the Auto/Manual (Input Disconnect) switch in MANUAL position. The choice of either of these two methods of terminating an input operation is left to the programmer.

### Output

An output operation is initiated by a 4210 EF code followed by an OUT instruction. The control circuits store the print select command and the function ready signal and the typewriter returns the output resume signal. The computer executes the OUT instruction and sends 6-bit character codes and information ready signals to the typewriter unit. The information enters the translator register, the translator magnets are actuated, and the character is printed. An output resume signal is returned to the computer and the computer responds with the next character and an information ready signal if more characters are to be printed.

### Status Request Signals

The status request, 4240 EF code, and the five status response signals allow the computer to determine the operating condition of the typewriter. The typewriter unit responds to a 4240 code followed by the INA instruction with the following codes.

|      |                                   |                                                                                                                                     |
|------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| 0000 | Typewriter Ready                  | Power has been applied to the typewriter, the mode switch is set to COMPUTER, and the typewriter is not being used by the computer. |
| 0004 | Power Off                         | The typewriter power switch has not been turned on.                                                                                 |
| 0010 | Typewriter Not in Computer Status | The mode switch is not set to COMPUTER.                                                                                             |
| 0020 | Input Character Ready             | An input character is available to the computer.                                                                                    |
| 0040 | Output                            | The typewriter is performing a character output operation.                                                                          |

## CHAPTER 2

### OPERATION

To prepare the typewriter unit for use, apply power from the computer (indicated by the Ready light) and insert paper. All power and control cables must be connected.

#### APPLICATION OF POWER

Primary power, applied to the typewriter unit by the computer, is controlled by the On/Off switch under the right front corner of the machine. When power is applied to the unit, the fan located in the bottom of the cabinet should start immediately, forcing air through the grille above the fan. If the fan is inoperative, call maintenance.

#### MANUAL OPERATION

The typewriter may be removed from computer control by placing the Computer/Clear switch in the unmarked center position. The functions of the manual controls and indicators (mounted on the control panel) are listed in table 2.

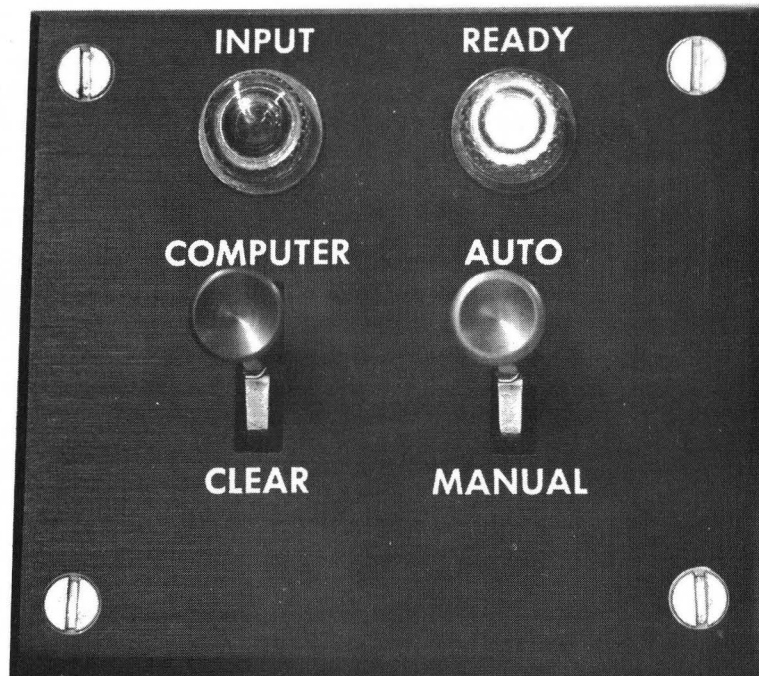


Figure 2-1. Typewriter Control Panel

TABLE 2. INDICATORS AND SWITCHES

| Name                   | Function                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ready Light            | Lit when power has been applied to logic circuits.                                                                                                                                                                                                                                                                                                                                                                                            |
| Input Light            | Lit when computer requests input information                                                                                                                                                                                                                                                                                                                                                                                                  |
| Computer/Clear Switch: |                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Up (lock)              | COMPUTER Places the unit under computer control for input and output operations.                                                                                                                                                                                                                                                                                                                                                              |
| Center                 | Unmarked position Removes the unit from computer control. If an input or output operation involving the unit is initiated when the switch is in this position, the SEL light in the computer status window is illuminated until the switch is moved to COMPUTER.<br><br>If the switch is moved from COMPUTER to neutral during operation the status window will display IN or OUT and the computer must be re-started by the Run-Step switch. |
| Down (mom.)            | CLEAR Momentary position resets the unit logic circuits. Sets control circuits after power is applied to the cabinet. This position will also drop an external function selection for input or output.                                                                                                                                                                                                                                        |
| Auto/Manual Switch:    |                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Up (lock)              | AUTO Allows the input disconnect signal to be sent to the computer each time a carriage return is typed during an input operation. The carriage return code (45) precedes the disconnect signal.                                                                                                                                                                                                                                              |
| Center                 | No disconnect is effected.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Down (mom.)            | MANUAL Provides for immediate termination of an input operation at any time by sending a disconnect signal to the computer.                                                                                                                                                                                                                                                                                                                   |

## CHAPTER 3

### PRINCIPLES OF OPERATION

#### EXTERNAL FUNCTION CODE

The EF instruction reads a 12-bit external function code within the computer which is then sent to the typewriter accompanied by a function ready. Acceptance of this signal prepares the three Select flip-flops (FFs) for recognition of one of the three external function codes (figure 3-1). If the typewriter unit is already engaged in an output operation, this circuit stores the fact that a function ready has been received until the current operation is concluded. With one exception, the typewriter itself clears the Select FF upon the completion of an operation. The Print Select FF is not cleared by a status request because that request may come during a print operation, and clearing Print Select would terminate the current print cycle.

The 42XX code sets one of the three Select FFs (figure 3-2). The Set FF ( $K^{106/107}$ ) must be energized for a selection to be made. As seen in figure 3-1, a status request will set  $K^{106/107}$  immediately; on a print or keyboard selection this action must wait until the current typewriter operation is completed.

#### TYPEWRITER CODES

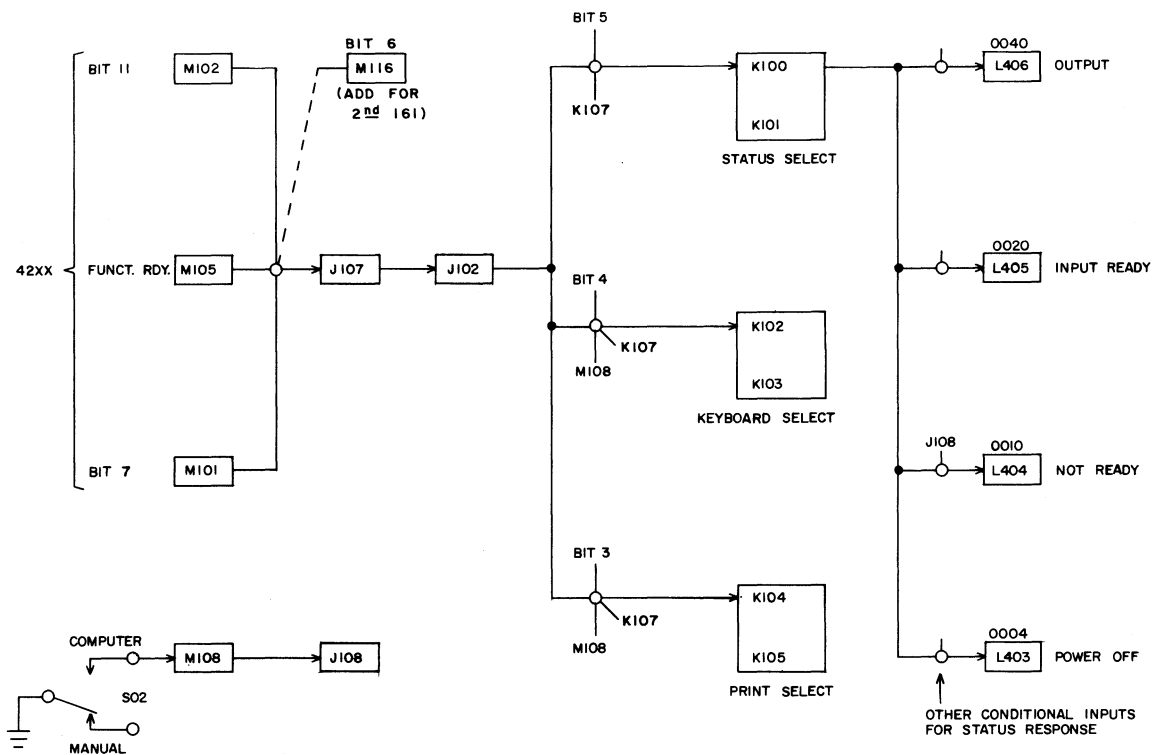
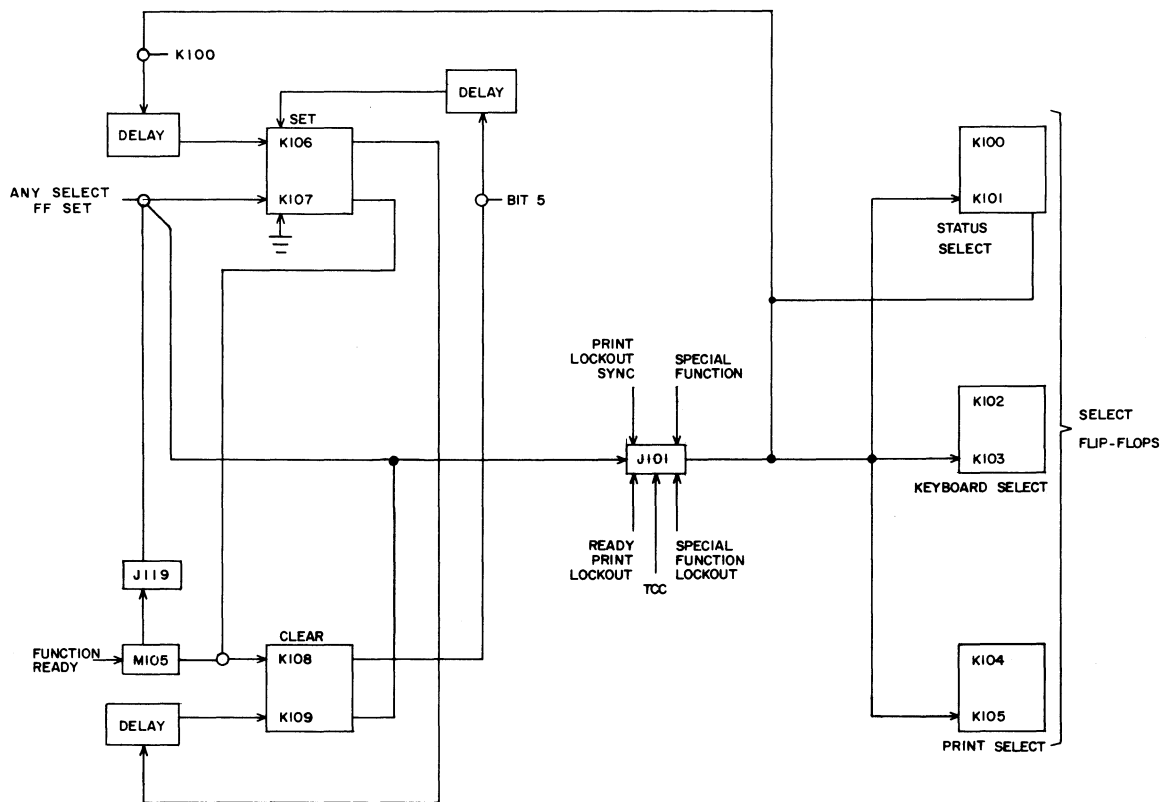
All typewriter characters and functions (table 1) are represented by unique combinations of 6 bits.

During keyboard input, striking a character key causes the coder to produce, as input to the computer, the code for that key. Space, carriage return, and tab are typewriter functions for which the keyboard control circuits form codes.

During output, 6-bit characters and functions from the computer are sent to the decoder where the decoder actuates the related key or function contact.

#### KEYBOARD OPERATION

The keyboard control circuit (figure 3-3) loads characters or functions from the coder into the keyboard register. During input this circuit enables the sampling of the keyboard common contacts and allows the circulation of data in the keyboard register. The circuit prevents the return of an input ready signal to the computer except when a request for keyboard input or status response has been made.



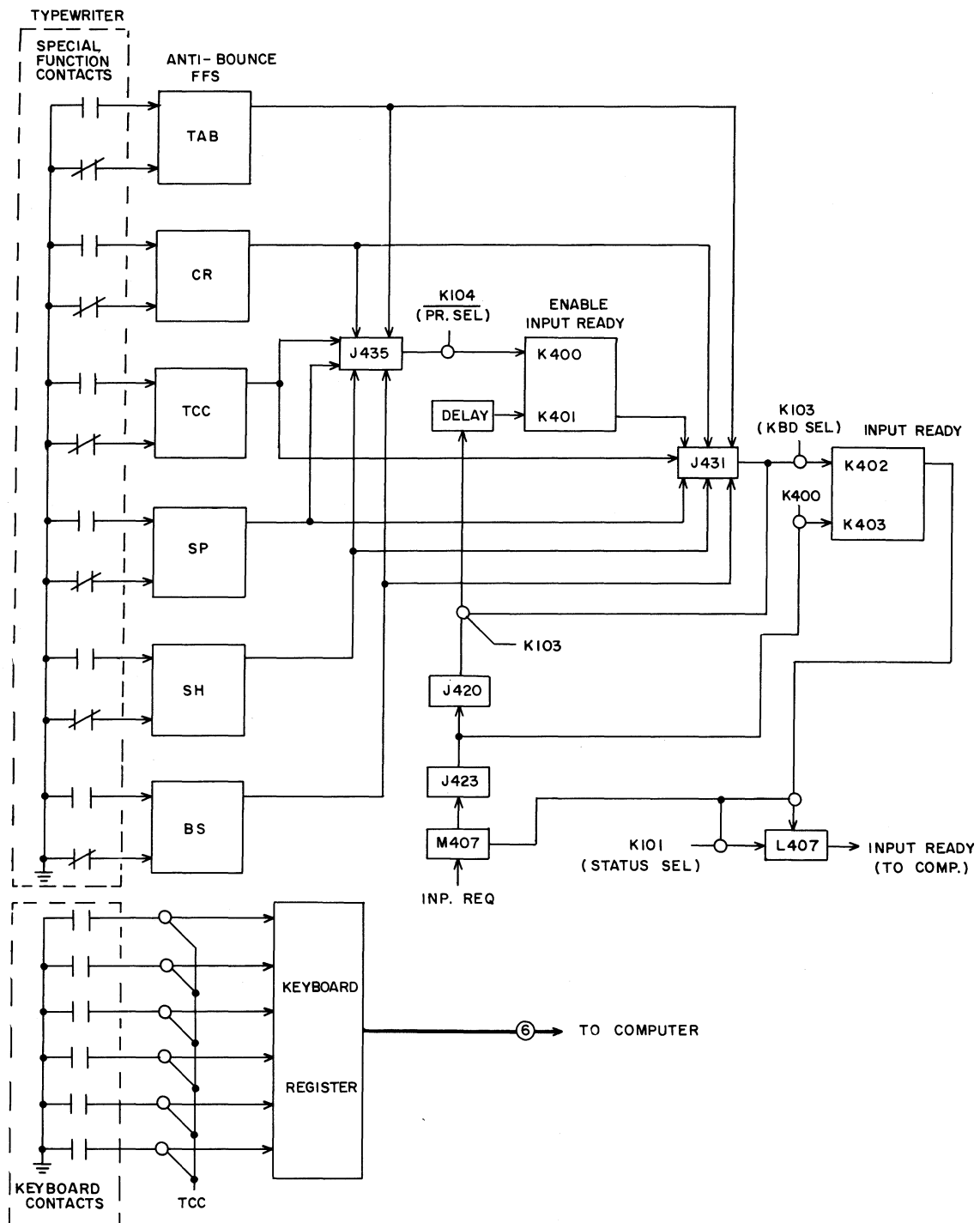


Figure 3-3. Keyboard Control

A typewriter key selection activates the TCC contacts. The NC contacts open. The NO contacts close, setting the TCC Anti-bounce FF. This allows the Enable Input Ready FF to be set, prohibits setting of the Input Ready FF, and introduces the character code into the recirculating stages of the keyboard register.

When the action for that character is completed (TCC contacts restored to normal), the TCC Anti-bounce FF is cleared, and the set inhibit (J431) to the Input Ready FF is removed. An input ready is returned to the computer and clears Enable Input Ready, which in turn clears the Input Ready FF, preparing the circuit for the next input request signal.

Although for special functions (Tab, CR, etc.) the function contacts replace the action of TCC, the analysis is the same; the action terminates by setting the Input Ready FF.

A status response bypasses the anti-bounce network and the input ready is returned to the computer when the status (input) request is received.

The sequence involved in the transmission of one character from the typewriter to the computer is:

- 1) Computer supplies the input request signal.
- 2) Character key is struck.
- 3) Encoder closes TCC and related keyboard contacts KC 1 through KC 6.
- 4) Character code is stored in keyboard register.
- 5) Restoration of TCC initiates an input ready to the computer and clears the network for the next input request signal.

The input disconnect circuit (figure 3-4) produces an input disconnect signal at the end of a keyboard operation. When the typewriter is in the automatic mode, this signal occurs following the transmission of the carriage return code to the computer. This short signal may be produced manually at the end of keyboard operation.

## PRINT OPERATION

The print control circuit (figure 3-5) accepts character codes from the computer and sends them to the translator magnets (TM1 through TM6) of the typewriter decoder. The translator cam magnetic (TCM) is energized to start the print cycle.

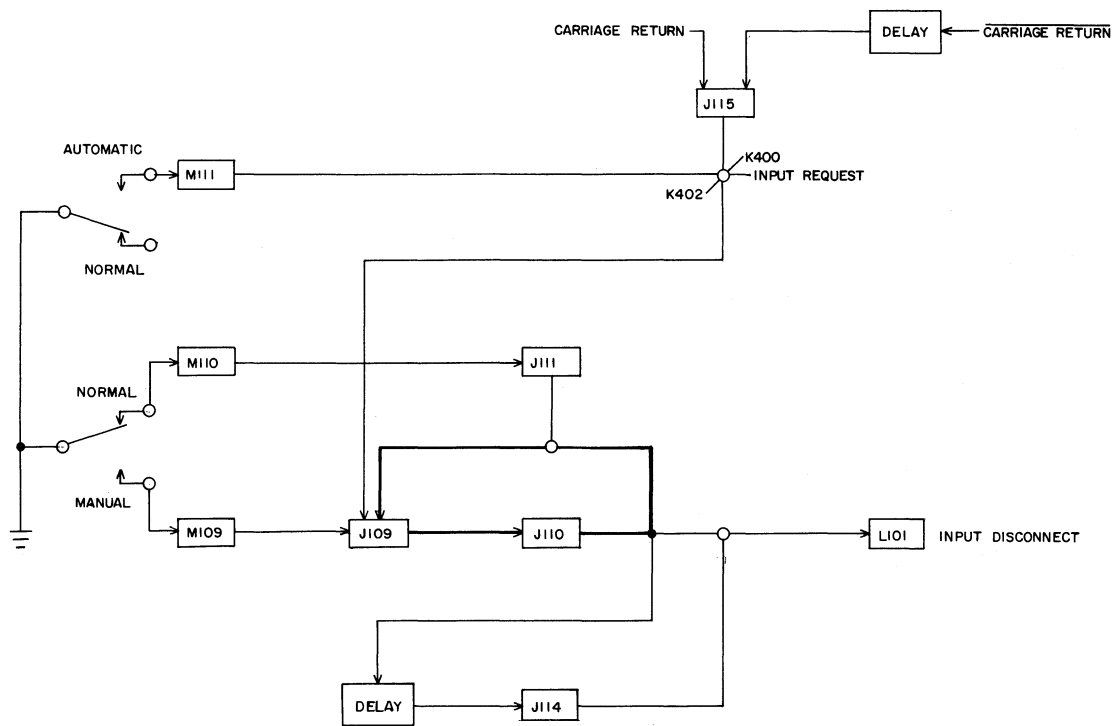


Figure 3-4. Input Disconnect Control

The cycle consists of:

- 1) Code Set (pull permutation bars)
- 2) Print (pull type bars)
- 3) Code Release (release permutation bars)

Initiation of each successive phase terminates the preceding phase.

To type a character, the computer produces an output information ready. An I → TR signal gates the character code to the translator register; translator magnets (TM 1 through TM 6) are energized. Print Lockout Sync establishes normal circulation in TR and the Terminate Set Code FF is energized.

Initiate Input is set which pulls TCM and starts the print cycle. Initiate Input is cleared by TBS which is actuated by TCM. The circuit is ready to receive another information ready but the Ready Print Lockout FF prevents new data from entering TR until the end of the print cycle.

The sequence of events for typing a character is: (figure 3-5)

- 1) Computer loads Z register and sends information ready.
- 2) Translator register is loaded.
- 3) Output resume signal is returned to the computer.
- 4) Computer drops information ready, clearing Resume FF.
- 5) Character is transferred to TM1 - TM6.
- 6) TCM energizes and causes character to be printed or function to be performed.
- 7) If code is for typewriter character, ribbon feed closes.  
If Back Space or Shift Code is involved, these contacts close.
- 8) Monitor Typewriter contacts open.
- 9) Ready Print lockout drops.
- 10) Step 1 can occur immediately after Step 4 but Step 2 will not proceed until Step 9 is complete.

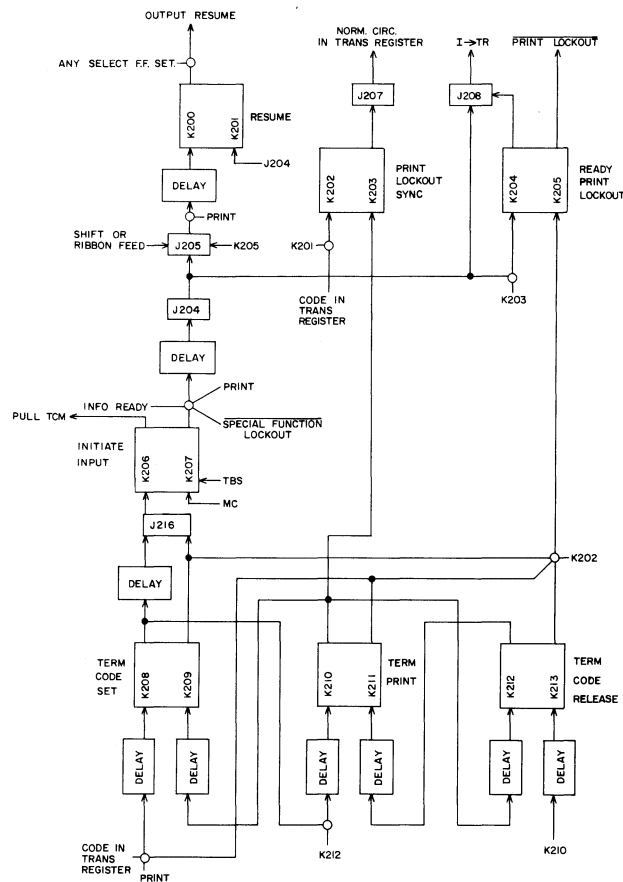


Figure 3-5. Print Control

A simplified diagram of the print cycle timing is shown in figure 3-6. The 100 ms interval will be extended for special function operations.

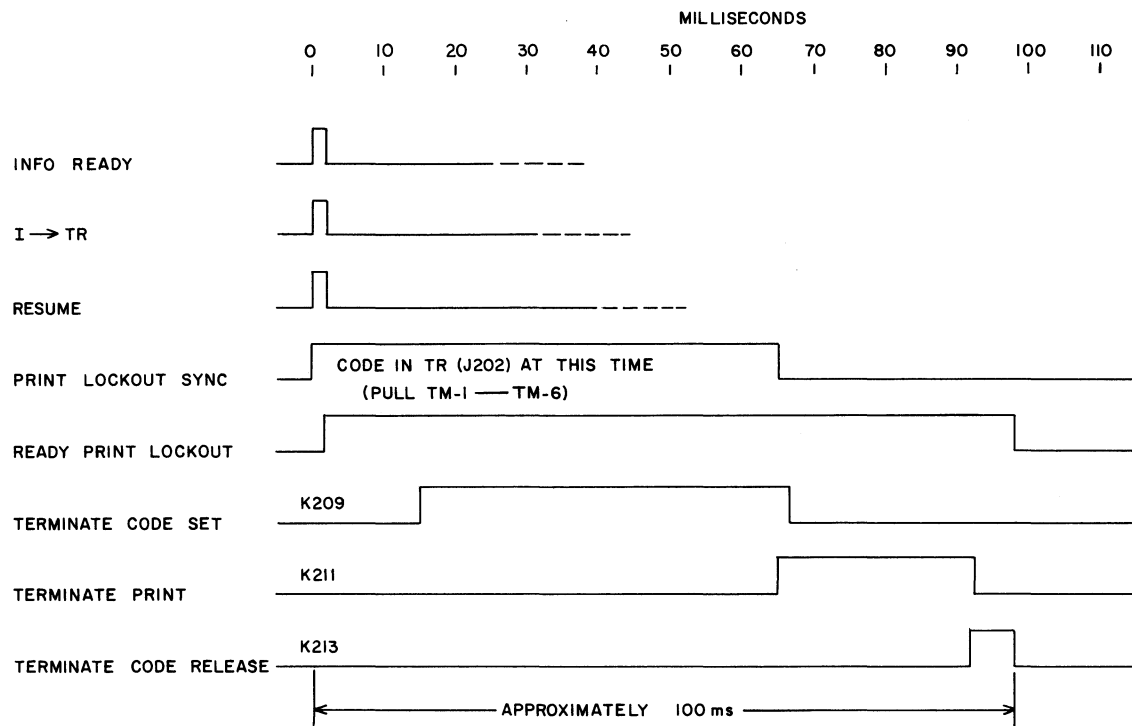


Figure 3-6. Simplified Typewriter Print Timing

## CHAPTER 4

### MAINTENANCE

This chapter provides general information for maintaining the typewriter unit control circuits. Maintenance personnel are assumed to be familiar with computer maintenance procedures and to have completed the maintenance training course provided by Control Data Corporation. The file of equations, Chapter 5, is the ultimate source of information on control circuits. The Monitor Typewriter Description, Operation and Maintenance manual (Control Data Publication 082) is also an aid to maintenance personnel.

Furnished as supplemental information and not as part of the typewriter unit instruction book is a listing of replaceable parts.

#### TEST EQUIPMENT AND TOOLS

Test equipment and tools for maintaining the typewriter unit are:

- Control Data 151 Card Tester (check performance of printed circuit cards - this is optional equipment)
- Oscilloscope (Tektronix 543 or equivalent)
- VTVM (Hewlett - Packard HP-400D or equivalent)
- Voltohmmeter
- Taper pin insertion tool
- Crimping tools
- Printed circuit card extender
- Hand tools commonly employed in electrical and mechanical maintenance

#### IDENTIFICATION NUMBERING SYSTEM

A coordinate numbering system is used in the typewriter unit. The basic typewriter unit number is 30000. The single logic chassis located within the cabinet is 30100. The basic component numbering system is:

| <u>Component Type</u> | <u>Cabinet</u> | <u>Chassis</u> | <u>Component</u> |
|-----------------------|----------------|----------------|------------------|
| XX                    | 3              | XX             | XX               |

Standard symbols (T - transformer, R - resistor, etc.) identify the type of component; components are numbered consecutively on printed circuit card schematics. The cabinet and chassis digits are omitted in identification if they are understood from the context or appear elsewhere on the diagram (e.g. J01, T01 etc).

Printed circuit cards in the logic chassis are located by a coordinate system:

| <u>Chassis</u> | <u>Ordinate (row)</u> | <u>Abscissa (column)</u> | <u>Test Point</u> |
|----------------|-----------------------|--------------------------|-------------------|
| X              | X                     | XX                       | X                 |

Because the control circuit equations are unique to this equipment, the cabinet number is omitted. The ordinate has a range of A through C; the abscissa a range of 01 through 48. Test point locations are identified by letter as the card is viewed from the wiring side (A through D, top to bottom).

## POWER AND COOLING

The typewriter unit derives its power from a 115v, single phase convenience outlet at the site. Power is available to the Monitor Typewriter and the convenience outlet in the rear of the cabinet whenever the 161 is connected to the site power source. However, the 161 power supply and blower can only be energized by pressing the Power On switch on the computer console. Table 3 lists all replaceable fuses in the typewriter cabinet.

TABLE 3. REPLACEABLE FUSES

| Input Power Requirements       | Fuse No. | Rating   | Protects           |
|--------------------------------|----------|----------|--------------------|
| 60 Cycle:<br>115 vac<br>60 cps | F01      | 8A, 125v | Convenience outlet |
|                                | F02      | 5A, 125v | Typewriter         |
|                                | F03      | 2A, 125v | Fan                |
|                                | F04      | 5A, 125v | -20                |
|                                | F05      | 3A, 125v | +20                |
|                                | F06      | 5A, 125v | -15                |

## POWER SUPPLY

The computer system operates from one basic power input (115 vac, 60 cps taken directly from the line) which operates such equipment as the convenience outlets, fan motors, punch motor, reader motor and the input to the power supply unit. The +20v and -20v supplies are identical; only the -20v is described. Groups of circuit components are represented by blocks.

The power transistors in this supply unit operate in the (saturated) switched mode, for greater efficiency. The power transistors switch on and off approximately 1200 times per second. Automatic control of the duty cycle provides constant output voltage at any required level of load current within the rating or any variation of source voltage between the limits of 90 and 130v rms.

In the off position of the regulator (figure 4-1) Q1 is biased off by PS2. The amount of bias on Q1 is limited to the forward drop across the silicon diode CR2. In the off condition, power from PS1 is blocked by Q1 and a zero voltage drop appears across RL.

The magnetic amplifier (figure 4-2) is a pulse width modulator controlled by the value of  $E_c$ . Negative pulses from this amplifier are applied to the base of Q1. Resistor R4, being ten times the value of R5, causes the positive off bias voltage from PS2 to appear at Q1 only during the absence of pulses from the magnetic amplifier. Flow of excessive reset current from PS2 through the gate windings of the magnetic amplifier would reduce gain. CR2 prevents this.

Triggering the magnetic amplifier causes Q1 to turn on. Current is released from PS1 into the filter circuit and RL. The end of the magnetic amplifier pulse removes the bias from Q1 and stops the flow of current from PS1. Energy stored in L1 continues to flow into RL and the damping diode CR1 until the next pulse from the magnetic amplifier occurs.

A voltage detector and stabilization network (figure 4-3) completes the regulating loop. Adjusting the voltage detector by varying R9 provides a constant voltage of 20v across RL. Oscillation is prevented by the stabilizing network consisting of the secondary winding on L1 together with R6, R7 and C2. This circuit generates currents of the correct amplitude and phase and applies them to the feedback winding on the magnetic amplifier. A filter (R6 and C2) removes 1200 cps noise from the feedback signal. The voltage detector operates only on the -20v section. A sense circuit, connected between

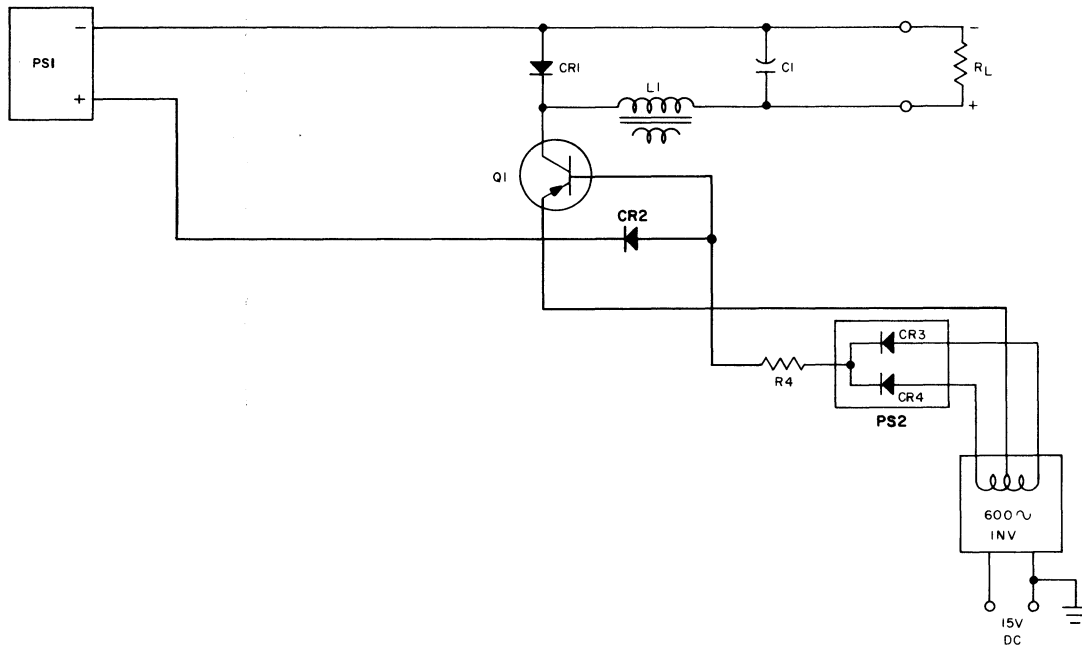


Figure 4-1. Steady-State OFF Condition

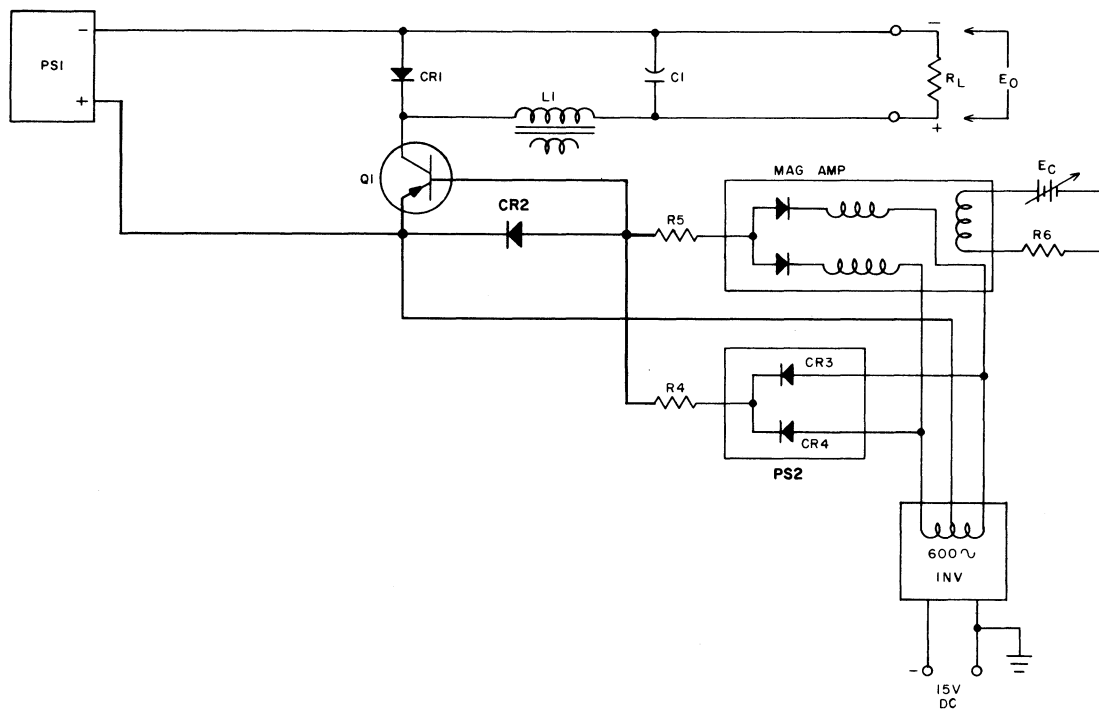


Figure 4-2. Magnetic Amplifier

-20v and +20v, provides an input to the -20v magnetic amplifier ( $T_4$ ) in order to ensure that the magnitude of +20 output voltage follows that of the -20v section.

The overvoltage protection circuit, figure 4-4, prevents any prolonged overvoltage at the output terminals of the power supply unit in event of transistor failure. In most cases, a failure of this type will appear as a short between collector and emitters, resulting in a surge of approximately 25v above the normal 20v output. Relay RY1 energizes when the total output voltage rises to near 60 volts. Relay RY2 is energized by contact 1A and locked in by contact 2A which opens contact 2B, de-energizing the primary winding of the power transformer T1.

#### COOLING SYSTEM

A fan at the bottom of the cabinet circulates air-conditioned room air over cabinet components. The cool room air enters the bottom of the cabinet, is forced over the cabinet components and out through louvres on the rear door of the cabinet.

The exhaust temperature at the top of the cabinet is monitored by a 100°F (38°C) thermostat (figure 1-2). If the temperature reaches 100°F in the cabinet the thermostat opens to drop all power from the unit except for the convenience outlet. An actuated thermostat closes automatically when the temperature drops below 100°F; power to the unit is automatically reinstated. The fan, thermostat and fuses for the cooling system are shown on the power distribution diagram in chapter 6 of this volume.

#### CABLING

Cabling in the typewriter cabinet is detailed on the diagram of typewriter interconnections in chapter 6 of this volume.

#### TYPEWRITER UNIT TESTING

Certain tests have been written to check the operation of the typewriter unit. These tests may be found in "Test and Library Routines for the 160 Computer" a Control Data Corporation publication.

#### OUTPUT TEST

The Output Test program (T006) consists of several test routines on one tape; the first two test the typewriter.

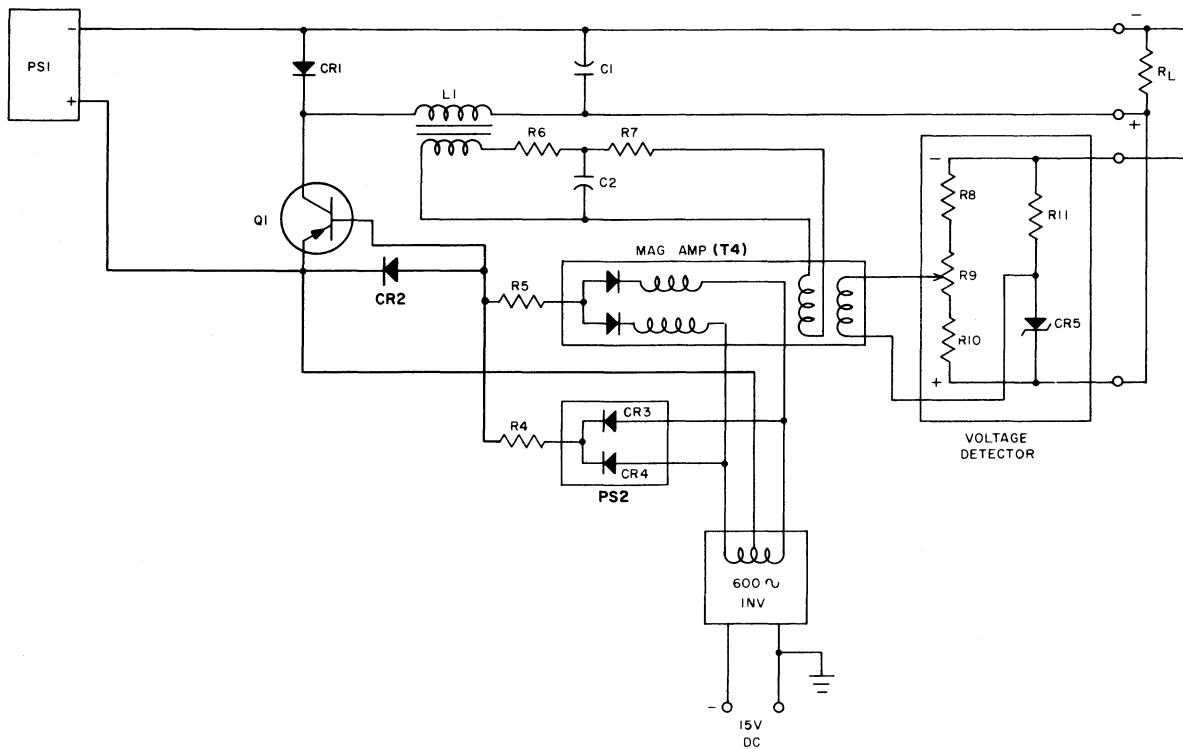


Figure 4-3. Voltage Detection and Stabilization Network

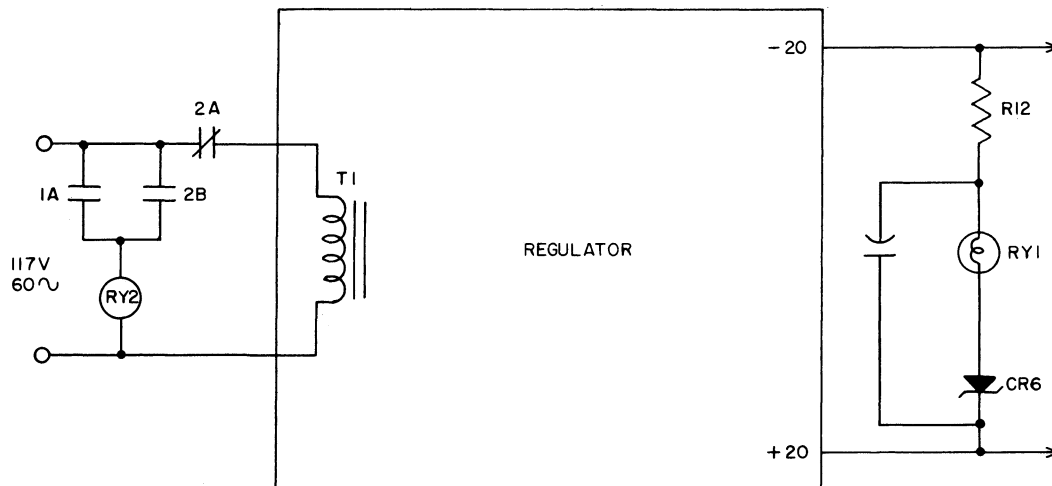


Figure 4-4. Over-Voltage Protection Circuit

The typewriter pattern test routine sends a repetitive pattern of binary 000000 to 111111 out to the typewriter. A visual check of the operation should be made. The typewriter alphabet test routine types out a pattern of all functions of the typewriter.

#### TYPEWRITER TEST

The typewriter input and output test (T009) consists of three routines. The first accepts ten characters typed in from the program and types out a carriage return followed by the ten characters. The second accepts information until an input disconnect occurs either automatically or manually. The program then types out a carriage return followed by the information up to the disconnect. The third routine accepts information until a carriage return is typed; it types out the same information.

#### PREVENTIVE MAINTENANCE

The section on Maintenance, Lubrication, and Adjustments in the Monitor Typewriter manual discusses preventive maintenance techniques applicable to the typewriter. The following preventive maintenance schedule is suggested for the typewriter unit.

|        |                    |          |                                 |
|--------|--------------------|----------|---------------------------------|
| Daily: | clean cabinet area | Weekly:  | clean, oil and check typewriter |
|        | run test programs  | Monthly: | check fan                       |

## CHAPTER 5

### FILE OF EQUATIONS

As in the computer, the logical interconnection of most printed circuit cards in the typewriter unit is described by Boolean algebraic equations. The file of these equations is the most important source of information about the logic of the typewriter unit.

#### EQUATION SYMBOL ASSIGNMENTS

|   |   |                    |
|---|---|--------------------|
| J | - | Control Inverters  |
| K | - | Flip-Flops         |
| L | - | Output Conversions |
| M | - | Input Conversions  |
| Y | - | Delays             |

The file of equations is preceded by card placement charts showing the physical location of the logic elements. The use of the file and card placement charts is explained in Volume 2 (Maintenance) of the computer instruction book series.

# TYPEWRITER CHASSIS (30100)

## VERTICAL COORDINATE A

|    |      |      |    |    |                |      |    |
|----|------|------|----|----|----------------|------|----|
| 17 | J117 | J216 | 22 | 33 | J208           | 13   |    |
| 18 |      |      | 77 | 34 | K204           | K205 | 32 |
| 19 |      |      |    | 35 | Capacitor Card |      | 73 |
| 20 | J107 | J108 | 21 | 36 | K214           | K215 | 33 |
| 21 | K206 | K207 | 32 | 37 |                | J436 | 21 |
| 22 | J413 | J115 | 22 | 38 | K414           | K415 | 31 |
| 23 | K100 | K101 | 31 | 39 | K412           | K413 | 31 |
| 24 | J102 |      | 15 | 40 | K400           | K401 | 32 |
| 25 | K102 | K103 | 31 | 41 | J431           |      | 16 |
| 26 | J101 |      | 16 | 42 | K404           | K405 | 31 |
| 27 | K104 | K105 | 31 | 43 | K406           | K407 | 31 |
| 28 | J204 | J217 | 21 | 44 | K408           | K409 | 31 |
| 29 | J215 | J205 | 23 | 45 | K410           | K411 | 31 |
| 30 | K200 | K201 | 32 | 46 |                |      |    |
| 31 | J207 |      | 11 | 47 |                |      |    |
| 32 | K202 | K203 | 32 | 48 |                |      |    |

## VERTICAL COORDINATE B

|    |                |      |      |    |      |      |      |    |
|----|----------------|------|------|----|------|------|------|----|
| 17 | Cable Jumpers  |      |      | 33 | J309 |      | J311 | 22 |
| 18 | Cable Jumpers  |      |      | 34 |      | J411 |      | 16 |
| 19 | M420           | M421 | M422 | 61 | 35   | J407 | J435 | 24 |
| 20 | J111           |      | J109 | 23 | 36   | J305 | J307 | 22 |
| 21 | K106           |      | K107 | 32 | 37   | J302 | J304 | 21 |
| 22 | Capacitor Card |      |      | 73 | 38   | J301 | J303 | 22 |
| 23 | K108           |      | K109 | 31 | 39   | J116 | J106 | 21 |
| 24 | J202           |      | J114 | 21 | 40   | K402 | K403 | 32 |
| 25 | K208           |      | K209 | 32 | 41   | J410 | J412 | 21 |
| 26 | Capacitor Card |      |      | 73 | 42   | J406 | J408 | 21 |
| 27 | K210           |      | K211 | 32 | 43   | J402 | J404 | 21 |
| 28 | Capacitor Card |      |      | 73 | 44   | J432 | J306 | 21 |
| 29 | K212           |      | K213 | 32 | 45   |      | J424 | 11 |
| 30 |                | J201 |      | 16 | 46   |      | J405 | 15 |
| 31 | J209           |      | J312 | 21 | 47   | J403 | J409 | 23 |
| 32 | J308           |      | J310 | 21 | 48   |      | J401 | 15 |

# TYPEWRITER CHASSIS (30100)

## VERTICAL COORDINATE C

|    |      |      |      |    |    |      |      |      |    |
|----|------|------|------|----|----|------|------|------|----|
| 17 | P001 | P002 | P003 | 86 | 33 | L301 | L302 | L303 | 62 |
| 18 |      |      |      |    | 34 | M304 | M305 | M106 | 61 |
| 19 | P004 | P005 | P006 | 86 | 35 | M301 | M302 | M303 | 61 |
| 20 |      |      |      |    | 36 |      | J210 |      | 11 |
| 21 | P007 |      |      | 86 | 37 | L307 | L408 |      | 62 |
| 22 |      |      |      |    | 38 | L404 | L405 | L406 | 67 |
| 23 | L201 | L101 | L407 | 67 | 39 | L401 | L402 | L403 | 67 |
| 24 | J105 |      | J110 | 22 | 40 | J119 |      | J434 | 21 |
| 25 | M306 | M107 | M108 | 87 | 41 | J211 |      | J423 | 22 |
| 26 | M109 | M110 | M111 | 61 | 42 | J118 |      | J420 | 22 |
| 27 | M105 | M112 | M113 | 87 | 43 |      | J414 |      | 11 |
| 28 | M204 | M101 | M102 | 61 | 44 | M413 | M414 | M415 | 61 |
| 29 | M114 | M115 | M116 | 61 | 45 | M410 | M411 | M412 | 61 |
| 30 | M201 | M202 | M203 | 61 | 46 | M407 | M408 | M409 | 87 |
| 31 |      | J433 |      | 11 | 47 | M404 | M405 | M406 | 61 |
| 32 | L304 | L305 | L306 | 62 | 48 | M401 | M402 | M403 | 61 |

$$J^{101} = K^{108} + J^{210} + K^{203} + K^{205} + K^{215} + K^{409}$$

$$A26B : K^{106} : : K^{103} : K^{105}$$

$$J^{102} = J^{107} + M^{116} + M^{113} + M^{114} + M^{115}$$

$$A24B : K^{100} : K^{102} : K^{104} : L^{201} : K^{106}$$

$$J^{105} = M^{106} + M^{107}$$

$$C24A : J^{116} : J^{106}$$

$$J^{106} = J^{105}$$

$$B39C : K^{203} : K^{205} : K^{215} : K^{401} : K^{403}$$

$$J^{107} = M^{101} M^{102} M^{105}$$

$$A20A : J^{102}$$

$$J^{108} = M^{108}$$

$$A20C : L^{404}$$

$$J^{109} = M^{109} + J^{110} J^{111} + M^{111} J^{420} K^{400} J^{115} K^{402}$$

$$B20C : J^{110}$$

$$J^{110} = J^{109} + K^{102}$$

$$C24C : L^{101} : J^{114} : J^{109}$$

$$J^{111} = M^{110} + Y^{999} + Y^{999}$$

$$B20A : J^{109}$$

$$J^{114} = J^{110} Y^{102}$$

$$B24C : L^{101}$$

$$J^{115} = K^{407} + K^{406} Y^{101}$$

$$A22C : J^{109}$$

$$J^{116} = J^{105}$$

$$B39A : K^{201} : K^{207} : K^{209} : K^{211} : K^{213}$$

$$J^{117} = K^{106} + Y^{999}$$

$$A17A : K^{100} : K^{102} : K^{104} : L^{201}$$

$$J^{118} = M^{112} + Y^{999}$$

$$C42A : L^{403}$$

$$J^{119} = M^{105}$$

$$C40A : K^{107}$$

$$J^{201} = J^{302} + J^{304} + J^{306} + J^{308} + J^{310} + J^{312}$$

$$B30B : J^{202}$$

$$J^{202} = J^{201}$$

$$B24A : K^{208} : K^{202}$$

$$J^{204} = M^{201} K^{206} K^{105} K^{214} Y^{212} K^{108}$$

$$A28A : J^{205} : J^{208} : K^{204} : K^{201}$$

$$J^{205} = J^{204} + J^{210} + K^{205}$$

$$A29C : K^{200}$$

$$J^{207} = K^{202}$$

$$A31B : J^{301} : J^{303} : J^{305} : J^{307} : J^{309} : J^{311}$$

$$J^{208} = J^{210} + J^{204} + K^{205}$$

$$A33B : J^{301} : J^{303} : J^{305} : J^{307} : J^{309} : J^{311}$$

$$J^{209} = M^{203}$$

$$B31A : J^{211} : K^{414}$$

$$J^{210} = K^{410} K^{406} K^{404} J^{211}$$

$$C36B : J^{101} : J^{205} : J^{208} : J^{211} : K^{215} : J^{413}$$

$$J^{211} = J^{209} J^{210} + M^{204}$$

$$C41A : J^{210}$$

$$J^{215} = J^{301} + J^{304} + J^{311}$$

$$A29A : K^{214} : K^{214} : K^{214}$$

$$J^{216} = K^{209} Y^{204} + K^{208}$$

$$A17C : K^{206}$$

$$J^{217} = K^{100} K^{102} K^{104}$$

$$A28C : L^{201} : K^{107} : L^{201}$$

$$J^{301} = M^{301} J^{208} + J^{302} J^{207}$$

$$B38A : J^{302} : L^{301} : J^{215}$$

$$J^{302} = J^{301}$$

$$B37A : J^{301} : : J^{201}$$

$$J^{303} = M^{302} J^{208} + J^{304} J^{207}$$

$$B38C : J^{304} : L^{302}$$

$$J^{304} = J^{303}$$

$$B37C : J^{303} : J^{215} : J^{201}$$

$$J^{305} = M^{303} J^{208} + J^{306} J^{207}$$

$$B36A : J^{306} : K^{214} : L^{303} : K^{214}$$

$$J^{306} = J^{305}$$

$$B44C : J^{305} : K^{214} : J^{201}$$

$$J^{307} = M^{304} J^{208} + J^{308} J^{207}$$

$$B36C : J^{308} : K^{214} : L^{304} : K^{214}$$

$$J^{308} = J^{307}$$

$$B32A : J^{307} : K^{214} : J^{201}$$

$$J^{309} = M^{305} J^{208} + J^{310} J^{207}$$

$$B33A : J^{310} : K^{214} : L^{305} : K^{214}$$

$$J^{310} = J^{309}$$

$$B32C : J^{309} : K^{214} : J^{201}$$

$$J^{311} = M^{306} J^{208} + J^{312} J^{207}$$

$$B33C : J^{312} : L^{306} : J^{215}$$

$$J^{312} = J^{311}$$

$$B31C : J^{311} : : J^{201}$$

$$J^{401} = K^{407} + J^{424} M^{401} + J^{414} J^{402} + K^{405} + K^{413} + K^{415}$$

$$B48B : J^{402}$$

$$J^{402} = J^{401}$$

$$B43A : L^{401} : J^{401}$$

$$J^{403} = J^{424} M^{402} + J^{414} J^{404} + K^{413}$$

$$B47A : J^{404}$$

$$J^{404} = J^{403}$$

$$B43C : L^{402} : J^{403}$$

$$J^{405} = K^{407} + K^{411} + J^{424} M^{403} + J^{414} J^{406} + K^{413}$$

$$B46B : J^{406}$$

$$J^{406} = J^{405}$$

$$B42A : L^{403} : J^{405}$$

$$J^{407} = K^{405} + J^{424} M^{404} + J^{414} J^{408} + K^{413} M^{422}$$

$$B35A : J^{408}$$

$$J^{408} = J^{407}$$

$$B42C : L^{404} : J^{407}$$

$$J^{409} = J^{424} M^{405} + J^{414} J^{410} + K^{415}$$

$$B47C : J^{410}$$

$$J^{410} = J^{409}$$

$$B41A : L^{405} : J^{409}$$

$$J^{411} = K^{405} + K^{407} + J^{424} M^{406} + J^{414} J^{412} + K^{413} + K^{415}$$

$$B34B : J^{412}$$

$$J^{412} = J^{411}$$

$$B41C : L^{406} : J^{411}$$

$$J^{413} = J^{210} + Y^{999}$$

$$A22A : J^{434}$$

$$J^{414} = K^{400} K^{402}$$

$$C45B : J^{411} : J^{409} : J^{407} : J^{405} : J^{403} : J^{401}$$

$$J^{420} = J^{423} + K^{109}$$

$$C42C : L^{408} : J^{109} : K^{401}$$

$$J^{423} = M^{407} + Y^{999}$$

$$C41C : J^{420} : : K^{403}$$

$$J^{424} = K^{408}$$

$$B45B : J^{411} : J^{409} : J^{407} : J^{405} : J^{403} : J^{401}$$

$$J^{431} = K^{411} + K^{409} + K^{405} + K^{407} + K^{400} + J^{436}$$

$$A41B : K^{402} : K^{401} : L^{405}$$

$$J^{432} = J^{435} K^{412} K^{414}$$

$$B44A : K^{400}$$

$$J^{433} = K^{102}$$

$$C31B : L^{403} : L^{402} : L^{401} : L^{406} : L^{405} : L^{404}$$

$$J^{434} = K^{214} K^{202} K^{204} J^{413}$$

$$C40C : L^{406}$$

$$J^{435} = K^{411} + K^{409} + K^{407} + K^{405}$$

$$B35C : J^{432}$$

$$J^{436} = K^{414} K^{412}$$

$$A37C : J^{431}$$

$$K^{100} = K^{101} + J^{102} M^{306} J^{117}$$

$$A23A : K^{101} : L^{408} : K^{106} : : J^{217}$$

$$K^{101} = K^{100} + K^{109}$$

$$A23C : K^{100} : L^{406} : L^{405} : L^{404} : L^{403} : L^{407}$$

$$K^{102} = K^{103} + J^{102} M^{305} M^{108} J^{117}$$

$$A25A : K^{103} : : J^{110} : J^{433} : J^{217}$$

$$K^{103} = K^{102} + J^{101}$$

$$A25C : K^{102} : L^{408} : K^{402} : K^{401}$$

$$K^{104} = K^{105} + J^{102} M^{304} M^{108} J^{117}$$

$$A27A : K^{105} : J^{217} : K^{400}$$

$$K^{105} = K^{104} + J^{101}$$

$$A27C : K^{104} : J^{204} : : K^{208} : K^{200}$$

$$K^{106} = K^{107} + J^{101} K^{100} Y^{103} + K^{109} M^{306} Y^{107} J^{102}$$

$$B21A : K^{107} : K^{108} : J^{117}$$

$$K^{107} = K^{106} + K^{108} J^{119} J^{217} + Y^{999}$$

$$B21C : K^{106} : K^{109}$$

$$K^{108} = K^{109} + K^{106} M^{105}$$

$$B23A : K^{109} : K^{107} : J^{101} : L^{201} : J^{204}$$

$$K^{109} = K^{108} + K^{107} Y^{105}$$

$$B23C : K^{108} : J^{420} : K^{106} : K^{101}$$

$$K^{200} = K^{201} + J^{205} K^{105} Y^{213} + K^{201}$$

$$A30A : K^{201}$$

$$K^{201} = K^{200} + J^{204} + J^{116}$$

$$A30C : K^{200} : L^{201} : K^{202} : K^{200}$$

$$K^{202} = K^{203} + K^{201} J^{202} + K^{203}$$

$$A32A : K^{203} : K^{205} : J^{207} : J^{434}$$

$$K^{203} = K^{202} + K^{211} + J^{106}$$

$$A32C : K^{202} : K^{204} : K^{202} : J^{101}$$

$$K^{204} = K^{205} + K^{203} J^{204} + K^{205}$$

$$A34A : K^{205} : J^{434}$$

$$K^{205} = K^{204} + K^{202} K^{210} K^{212} K^{208} + J^{106}$$

$$A34C : K^{204} : J^{205} : J^{208} : K^{204} : J^{101}$$

$$K^{206} = K^{207} + J^{216} + K^{207}$$

$$A21A : K^{207} : J^{204} : L^{307}$$

$$K^{207} = K^{206} + M^{202} + J^{116}$$

$$A21C : K^{206} : : K^{206}$$

$$K^{208} = K^{209} + J^{202} K^{210} K^{105} Y^{201} + K^{209}$$

$$B25A : K^{209} : K^{205} : J^{216}$$

$$K^{209} = K^{208} + K^{211} Y^{202} + J^{116}$$

$$B25C : K^{208} : J^{216} : K^{210} : K^{208}$$

$$K^{210} = K^{211} + K^{209} K^{212} Y^{203} + K^{211}$$

$$B27A : K^{211} : K^{208} : K^{213} : K^{205}$$

$$K^{211} = K^{210} + K^{213} Y^{205} + J^{116}$$

$$B27C : K^{210} : K^{209} : K^{212} : K^{203} : K^{210}$$

$$K^{212} = K^{213} + K^{211} Y^{206} + K^{213}$$

$$B29A : K^{213} : K^{205} : K^{210}$$

$$K^{213} = K^{212} + K^{210} Y^{207} : J^{116}$$

$$B29C : K^{212} : K^{211} : K^{212}$$

$$K^{214} = K^{215} + J^{215} J^{305} J^{308} J^{309} Y^{209} + J^{215} J^{306} J^{307} J^{309} Y^{210} + J^{215} J^{305} J^{307} J^{310} Y^{211}$$

$$A36A : K^{215} : J^{204} : K^{215} : J^{434}$$

$$K^{215} = K^{214} + J^{210} Y^{208} + J^{106} + K^{214}$$

$$A36C : K^{214} : J^{101}$$

$$K^{400} = K^{401} + J^{432} K^{104} + Y^{999}$$

$$A40A : K^{401} : J^{431} : J^{109} : J^{414} : K^{403}$$

$$K^{401} = K^{400} + J^{420} J^{431} K^{103} Y^{401} + J^{106}$$

$$A40C : K^{400}$$

$$K^{402} = K^{403} + J^{431} K^{103} + Y^{999}$$

$$B40A : K^{403} : J^{414} : J^{109}$$

$$K^{403} = K^{402} + K^{400} J^{423} + J^{106}$$

$$B^{40C} : K^{402} : : : L^{407}$$

$$K^{404} = K^{405} + M^{414}$$

$$A^{42A} : K^{405} : : J^{210}$$

$$K^{405} = K^{404} + M^{415}$$

$$A^{42C} : K^{404} : J^{401} : J^{407} : J^{411} : J^{431} : J^{435}$$

$$K^{406} = K^{407} + M^{412}$$

$$A^{43A} : K^{407} : : J^{210} : J^{115}$$

$$K^{407} = K^{406} + M^{413}$$

$$A^{43C} : K^{406} : J^{115} : J^{401} : J^{405} : J^{411} : J^{431} : J^{435}$$

$$K^{408} = K^{409} + M^{410}$$

$$A^{44A} : K^{409} : : J^{424}$$

$$K^{409} = K^{408} + M^{411}$$

$$A^{44C} : K^{408} : J^{101} : J^{431} : J^{435}$$

$$K^{410} = K^{411} + M^{408}$$

$$A^{45A} : K^{411} : : J^{210}$$

$$K^{411} = K^{410} + M^{409}$$

$$A^{45C} : K^{410} : J^{405} : J^{431} : J^{435}$$

$$K^{412} = K^{413} + M^{203} M^{420}$$

$$A^{39A} : K^{413} : J^{432} : J^{436}$$

$$K^{413} = K^{412} + M^{421}$$

$$A^{39C} : K^{412} : J^{411} : J^{407} : J^{405} : J^{403} : J^{401}$$

$$K^{414} = K^{415} + J^{209} M^{204}$$

$$A^{38A} : K^{415} : J^{432} : J^{436}$$

$$K^{415} = K^{414} + M^{203}$$

$$A^{38C} : K^{414} : J^{411} : J^{409} : J^{401}$$

$$L^{101} = J^{110} J^{114} + Y^{999}$$

$$C23B : 1J06-V 1J07-V$$

$$L^{201} = K^{201} J^{217} + K^{108} J^{102} J^{217} J^{117}$$

$$C23A : 1J04-S 1J05-S$$

$$L^{301} = J^{301}$$

$$C33A : P^{001}$$

$$L^{302} = J^{303}$$

$$C33B : P^{002}$$

$$L^{303} = J^{305}$$

$$C33C : P^{003}$$

$$L^{304} = J^{307}$$

$$C32A : P^{004}$$

$$L^{305} = J^{309}$$

$$C32B : P^{005}$$

$$L^{306} = J^{311}$$

$$C32C : P^{006}$$

$$L^{307} = K^{206}$$

$$C37A : P^{007}$$

$$L^{401} = J^{402} J^{433} + Y^{999}$$

$$C39A : 1J06-A 1J07-A$$

$$L^{402} = J^{404} J^{433} + Y^{999}$$

$$C39B : 1J06-B 1J07-B$$

$$L^{403} = J^{406} J^{433} + K^{101} J^{118}$$

$$C39C : 1J06-C 1J07-C$$

$$L^{404} = J^{408} J^{433} + K^{101} J^{108}$$

$$C38A : 1J06-D 1J07-D$$

$$L^{405} = J^{410} J^{433} + K^{101} J^{431}$$

$$C38B : 1J06-E 1J07-E$$

$$L^{406} = J^{412} J^{433} + K^{101} J^{434}$$

$$C38C : 1J06-F 1J07-F$$

$$L^{407} = K^{403} M^{407} + K^{101} M^{407}$$

$$C23C : 1J06-R 1J07-R$$

$$L^{408} = J^{420} K^{103} K^{100}$$

$$C37B : 1J02-N$$

$$M^{101} = 1J04-J 1J05-J$$

$$C28B : : J^{107}$$

$$M^{102} = 1J04-N 1J05-N$$

$$C28C : : J^{107}$$

$$M^{105} = 1J04-T 1J05-T$$

$$C27A : J^{107} : K^{108} : J^{119}$$

$$M^{106} = 1J04-U 1J05-U$$

$$C34C : J^{105}$$

$$M^{107} = 1J02-P$$

$$C25B : : J^{105}$$

$$M^{108} = 1J02-R$$

$$C25C : K^{102} : J^{108} : K^{104}$$

$$M^{109} = 1J02-S$$

$$C26A : J^{109}$$

$$M^{110} = 1J02-T$$

$$C26B : : J^{111}$$

$$M^{111} = 1J02-U$$

$$C26C : : J^{109}$$

$$M^{112} = 1J01-V 1J02-Y$$

$$C27B : J^{118}$$

$M^{113} = 1J04-M \ 1J05-M$

C27C :  $J^{102}$

$M^{114} = 1J04-L \ 1J05-L$

C29A :  $J^{102}$

$M^{115} = 1J04-K \ 1J05-K$

C29B :  $J^{102}$

$M^{116} = 1J04-H \ 1J05-H$

C29C :  $J^{102}$

$M^{201} = 1J04-R \ 1J05-R$

C30A : :  $J^{204}$

$M^{202} = 1J01-L$

C30B :  $K^{207}$

$M^{203} = 1J01-S$

C30C :  $J^{209}$  :  $K^{412}$   
:  $K^{415}$

$M^{204} = 1J01-H$

C28A :  $K^{414}$  :  $J^{211}$

$M^{301} = 1J04-A \ 1J05-A$

C35A : :  $J^{301}$

$M^{302} = 1J04-B \ 1J05-B$

C35B : :  $J^{303}$

$M^{303} = 1J04-C \ 1J05-C$

C35C : :  $J^{305}$

$M^{304} = 1J04-D \ 1J05-D$

C34A :  $K^{104}$  :  $J^{307}$

$M^{305} = 1J04-E \ 1J05-E$

C34B :  $K^{102}$  :  $J^{309}$

$M^{306} = 1J04-F \ 1J05-F$

C25A :  $J^{311}$  :  $K^{100}$  :  $K^{106}$

M<sup>401</sup> = 1J02-A

C48A : J<sup>401</sup>

M<sup>402</sup> = 1J02-B

C48B : : J<sup>403</sup>

M<sup>403</sup> = 1J02-C

C48C : J<sup>405</sup>

M<sup>404</sup> = 1J02-D

C47A : J<sup>407</sup>

M<sup>405</sup> = 1J02-E

C47B : J<sup>409</sup>

M<sup>406</sup> = 1J02-F

C47C : J<sup>411</sup>

M<sup>407</sup> = 1J06-S 1J07-S

C46A : J<sup>423</sup> : L<sup>407</sup> : L<sup>407</sup>

M<sup>408</sup> = 1J01-M

C46B : K<sup>410</sup>

M<sup>409</sup> = 1J01-N

C46C : K<sup>411</sup>

M<sup>410</sup> = 1J02-H

C45A : K<sup>408</sup>

M<sup>411</sup> = 1J02-J

C45B : K<sup>409</sup>

M<sup>412</sup> = 1J01-T

C45C : K<sup>406</sup>

M<sup>413</sup> = 1J01-U

C44A : K<sup>407</sup>

M<sup>414</sup> = 1J01-P

C44B : K<sup>404</sup>

$M^{415} = 1J01-R$

C44C :  $K^{405}$

$M^{420} = 1J01-H$

B19A :  $K^{412}$

$M^{421} = 1J01-W$

B19B :  $K^{413}$

$M^{422} = 1J01-Y$

B19C :  $J^{407}$

$P^{001} = L^{301}$

C17A : 1J01-A TM1

$P^{002} = L^{302}$

C17B : 1J01-B TM2

$P^{003} = L^{303}$

C17C : 1J01-C TM3

$P^{004} = L^{304}$

C19A : 1J01-D TM4

$P^{005} = L^{305}$

C19B : 1J01-E TM5

$P^{006} = L^{306}$

C19C : 1J01-F TM6

$P^{007} = L^{307}$

C21A : 1J01-J TCM

$Y^{101} = 40 \text{ us}$

B26-7 :  $J^{115}$

$Y^{102} = 20 \text{ us}$

B26-8 :  $J^{114}$

$$Y^{103} = 20 \text{ us}$$

$$B28-8 : K^{106}$$

$$Y^{105} = 5 \text{ us}$$

$$B22-6 : K^{109}$$

$$Y^{107} = 7.5 \text{ us}$$

$$B22-5 \ B22-4 \ B26-4 \ B28-4 \ B26-5 : K^{106}$$

$$Y^{201} = 30 \text{ ms}$$

$$A18-10 \ B22-11 \ B22-12 : K^{208}$$

$$Y^{202} = 400 \text{ us}$$

$$B26-10 : K^{209}$$

$$Y^{203} = 60 \text{ ms}$$

$$A18-7 \ A18-8 : K^{210}$$

$$Y^{204} = 400 \text{ us}$$

$$A35-10 : J^{216}$$

$$Y^{205} = 400 \text{ us}$$

$$B28-10 : K^{211}$$

$$Y^{206} = 30 \text{ ms}$$

$$A18-9 : K^{212}$$

$$Y^{207} = 5 \text{ ms}$$

$$B28-11 : K^{213}$$

$$Y^{208} = 200 \text{ us}$$

$$A35-9 : K^{215}$$

$$Y^{209} = 5 \text{ us}$$

$$B26-6 : K^{214}$$

$$Y^{210} = 5 \text{ us}$$

$$B28-6 : K^{214}$$

$$Y^{211} = 5 \text{ us}$$

$$A35-6 : K^{214}$$

$$Y^{212} = 1.5 \text{ us}$$

$$B28-5 : J^{204}$$

$$Y^{213} = 1.5 \text{ us}$$

$$A35-5 : K^{200}$$

$$Y^{401} = 1.5 \text{ us}$$

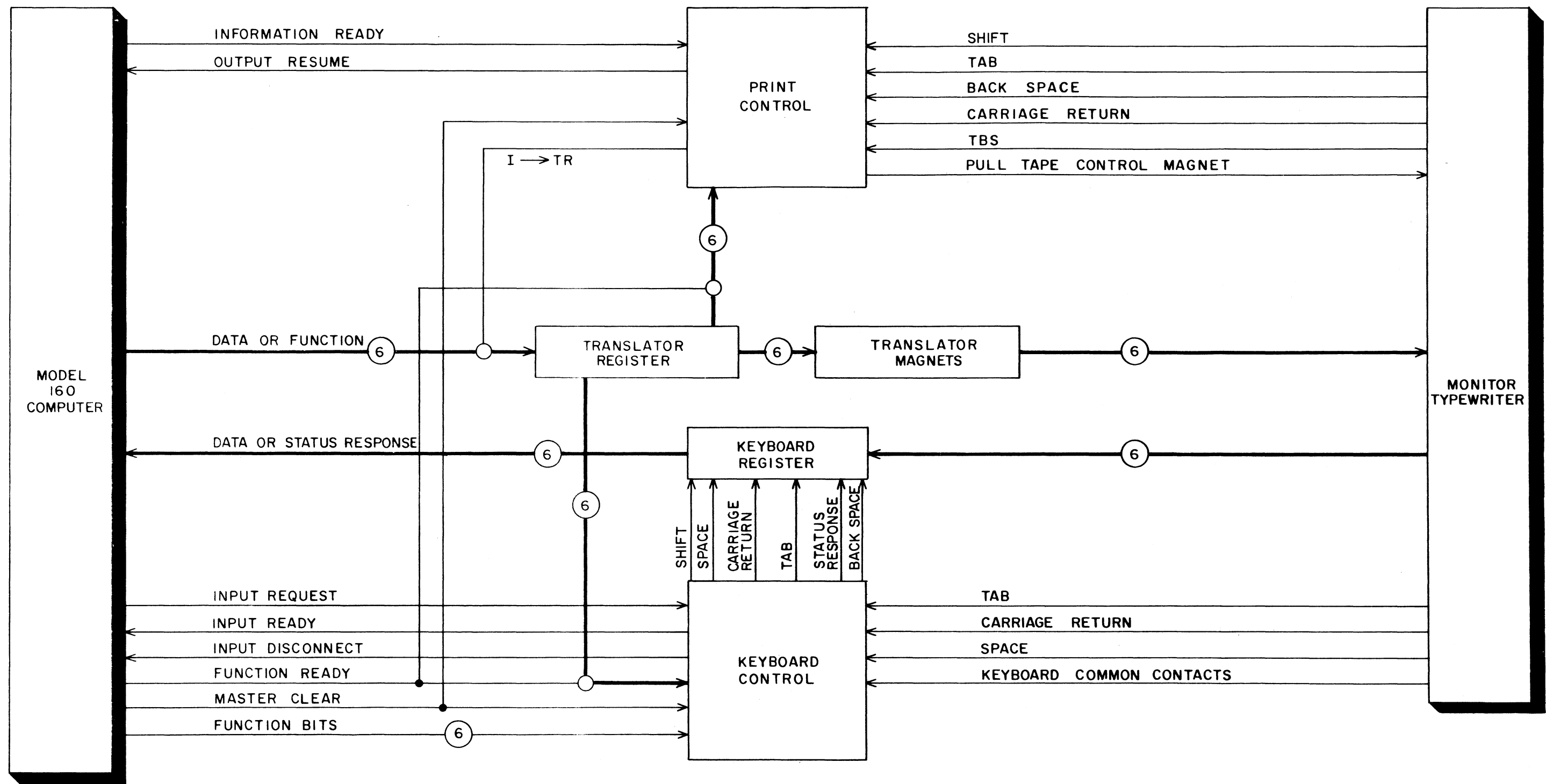
$$A35-4 : K^{401}$$

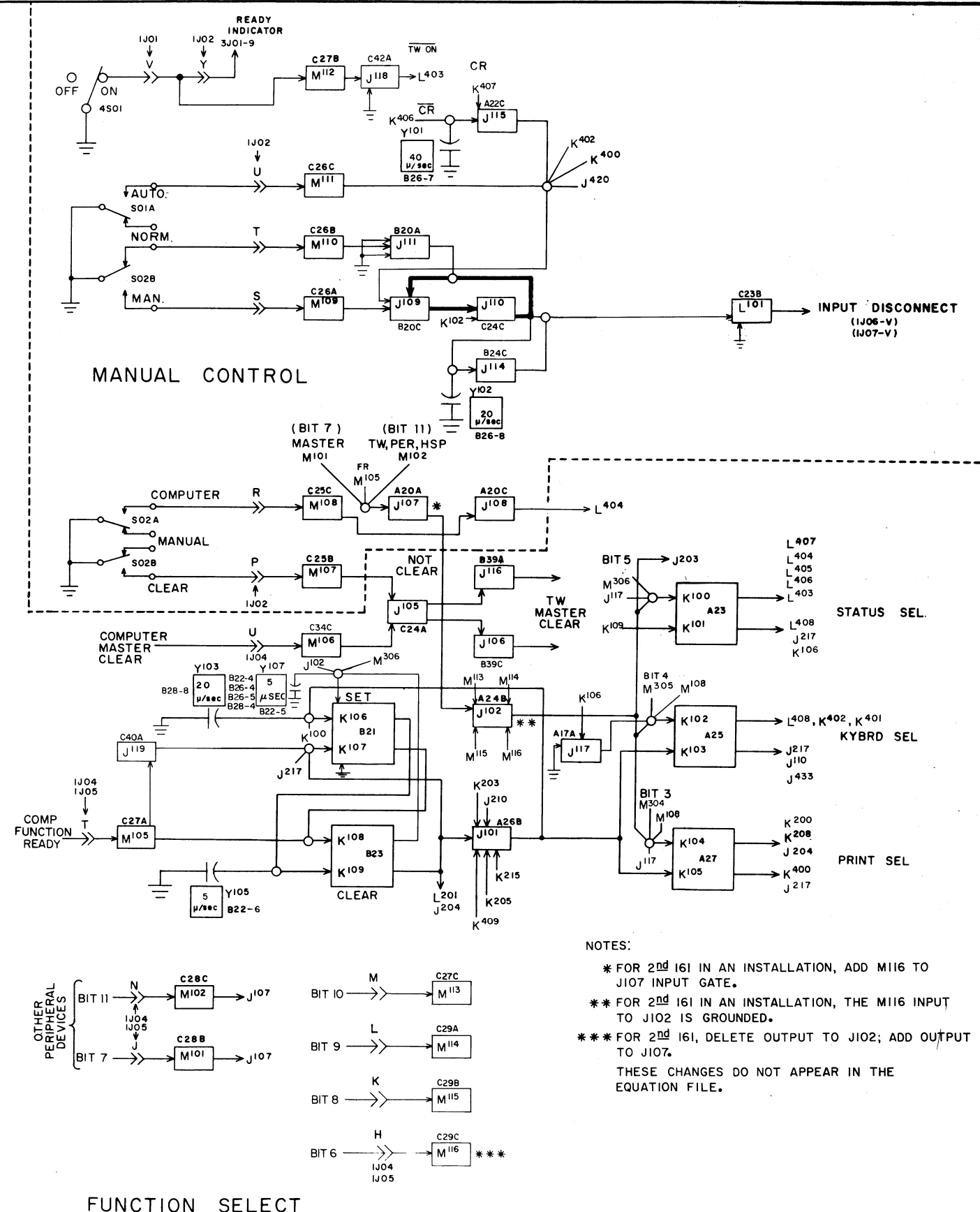
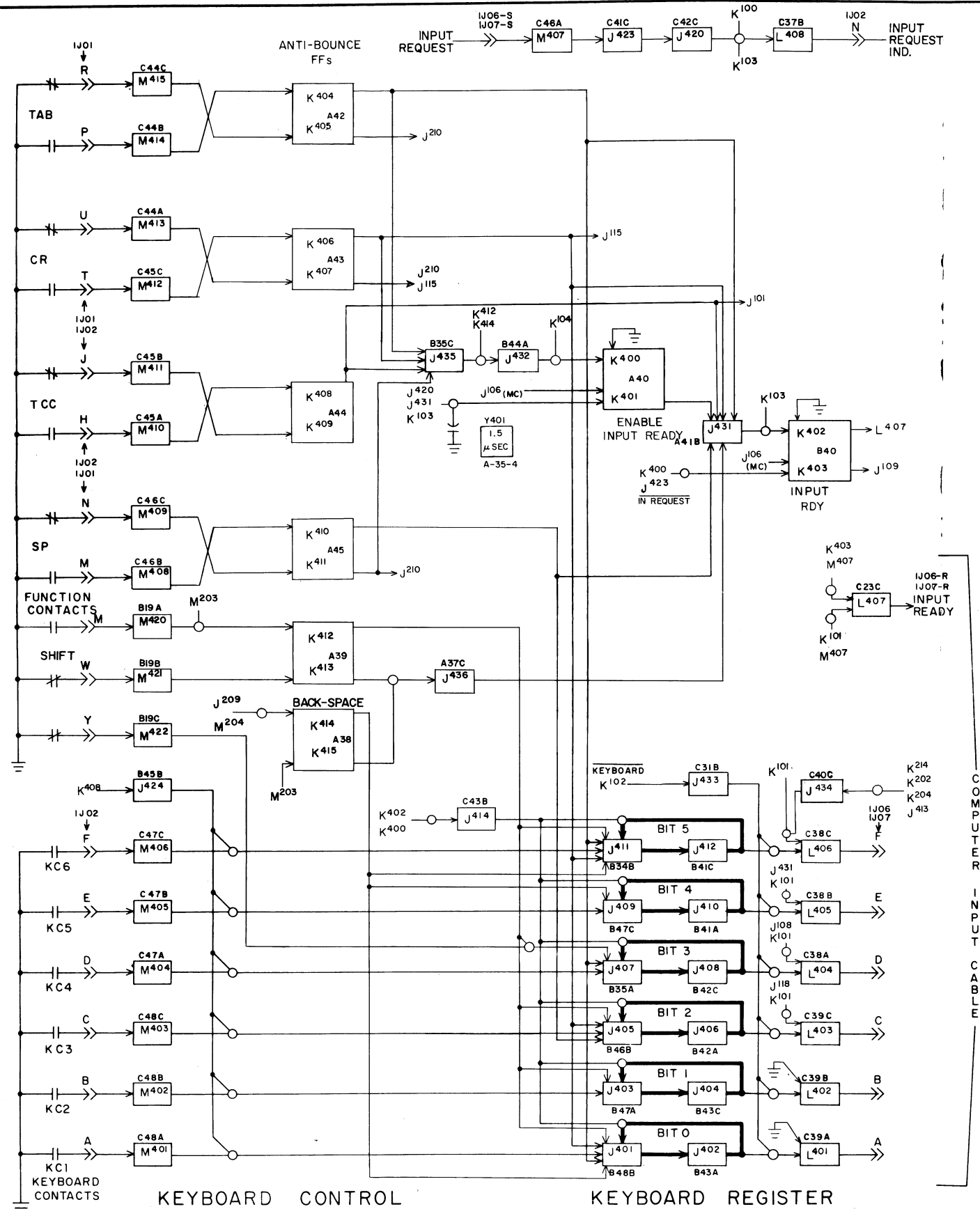
$$Y^{999} = \text{Ground}$$

..

CHAPTER 6  
EQUIPMENT DRAWINGS

| Title                                              | Page |
|----------------------------------------------------|------|
| 161 Typewriter Over-all                            | 6-3  |
| Electric Typewriter Manual and Keyboard<br>Control | 6-5  |
| Electric Typewriter Print Control                  | 6-7  |
| Wiring Diagram, Typewriter Interconnections        | 6-9  |
| Typewriter Cabinet, 60~ Power<br>Distribution      | 6-11 |
| Schematic, Power Supply                            | 6-13 |

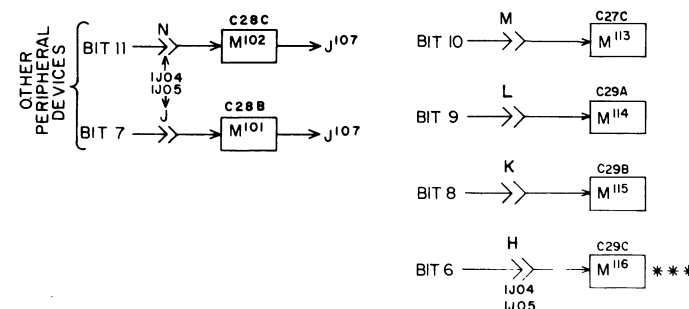


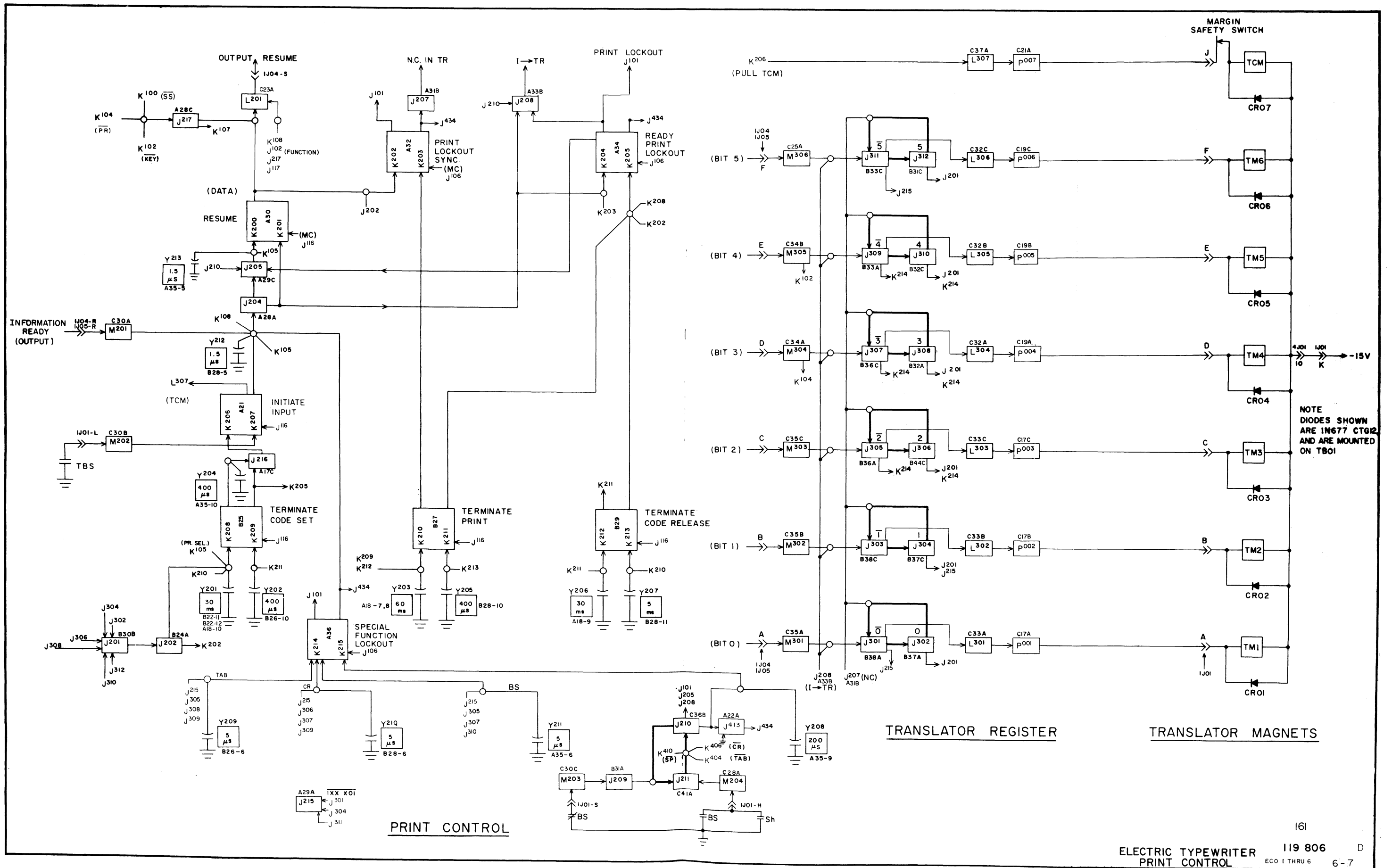


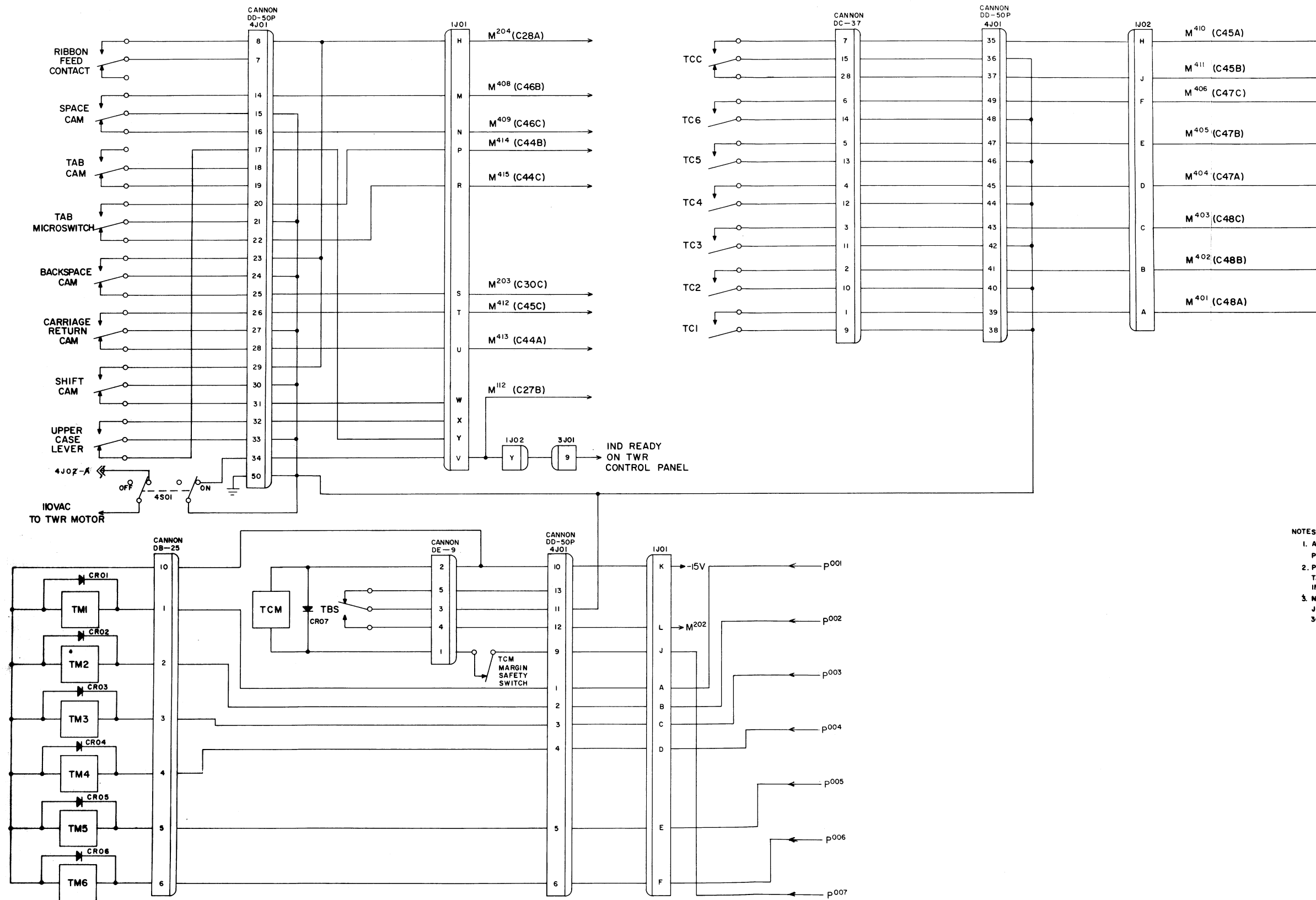
NOTES:

- \* FOR 2<sup>nd</sup> 161 IN AN INSTALLATION, ADD M116 TO J107 INPUT GATE.
- \*\* FOR 2<sup>nd</sup> 161 IN AN INSTALLATION, THE M116 INPUT TO J102 IS GROUND.
- \*\*\* FOR 2<sup>nd</sup> 161, DELETE OUTPUT TO J102; ADD OUTPUT TO J107.

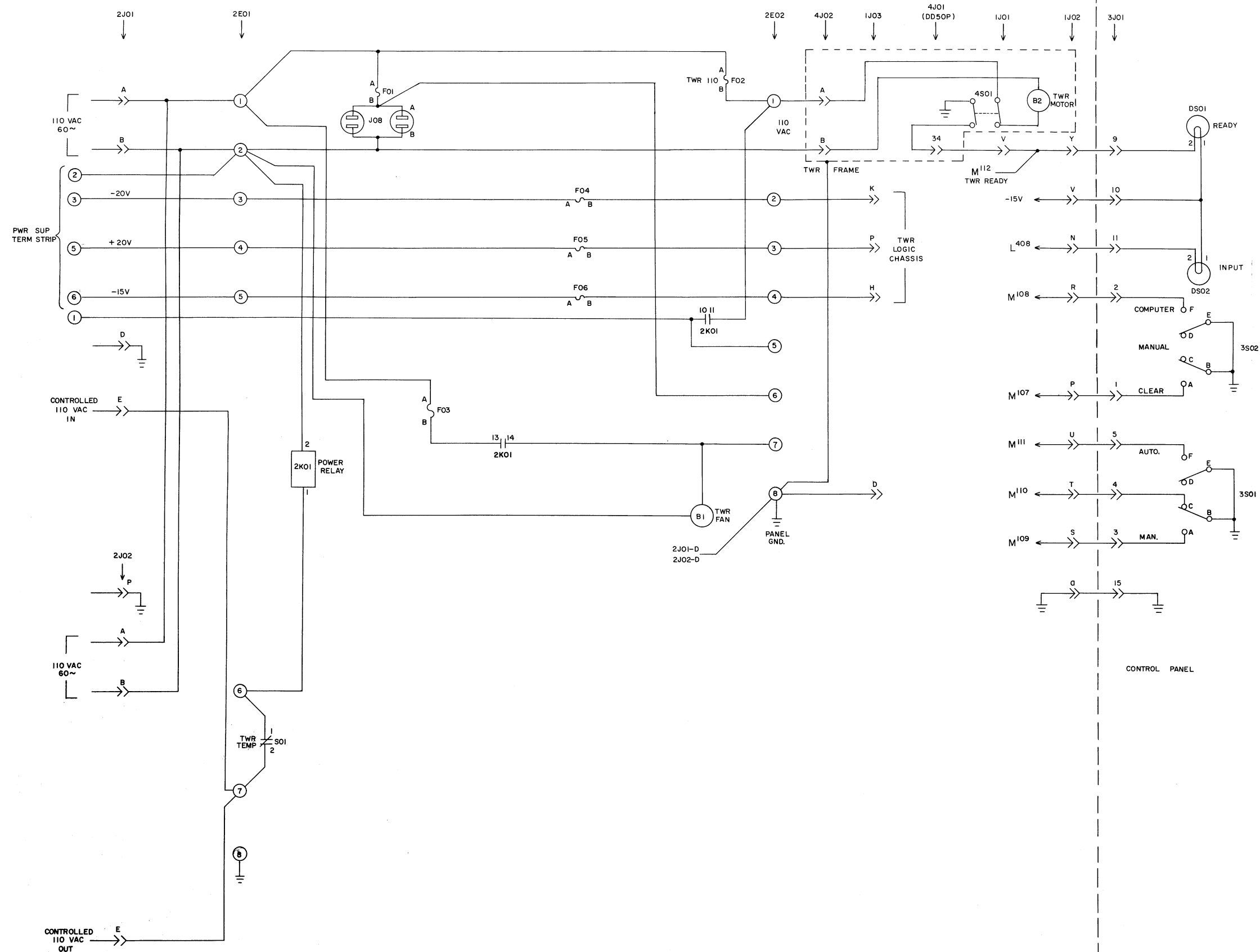
THESE CHANGES DO NOT APPEAR IN THE EQUATION FILE.





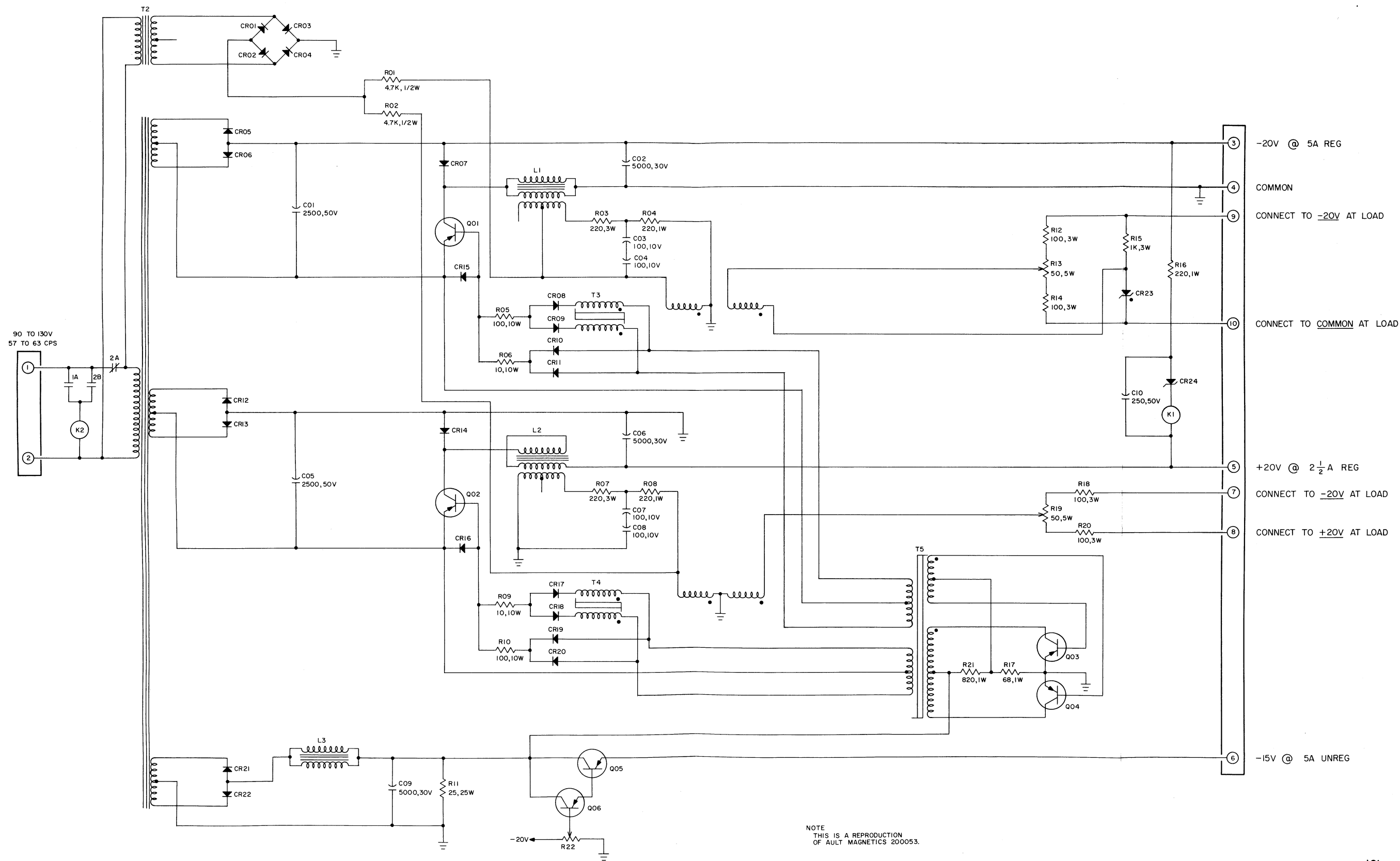


- NOTES
1. ALL DIODES ARE TG-12 (IN677) POLARIZED
  2. PORTIONS OF THIS DRAWING ARE TAKEN FROM SOROBAN ENGINEERING INC. DRAWING NO. C-1556.
  3. NUMBERS IN PARENTHESES INDICATE JACK ASSIGNMENTS LOCATED ON 30100 CHASSIS.



CONNECTOR KEY  
 1J01 LOGIC } TWR  
 1J02 LOGIC } LOGIC  
 1J03 POWER } CHASSIS  
 1J04 OUTPUT }

2J01 } JUNCTION BOX POWER  
 2J02 }  
 2E01 } JUNCTION BOX TERMINAL STRIPS  
 2E02 }  
 3J01 CONTROL PANEL CONNECTOR  
 4J01 } TWR CHASSIS  
 4J02 }



NOTE  
THIS IS A REPRODUCTION  
OF AULT MAGNETICS 200053.

**CONTROL DATA**  
CORPORATION

**COMPUTER DIVISION**

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